

# **Montana Fish, Wildlife & Parks**

## **SPECIFICATIONS FOR WORK SPECIAL PROVISIONS**

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## 1. PROJECT DESCRIPTION

The Project involves construction work associated with:

**Giant Springs State Park Rainbow Overlook Parking Lot and Improvements Project  
Fish, Wildlife & Parks (FWP) project # 7166605  
Located in Cascade County, MT**

The project consists of removing a portion of the parking lot, including asphalt, fence, barrier rocks and overburden, and installing subsurface drain lines.

## 2. PROJECT RELATED CONTACTS

Project contacts are designated as follows:

**Owner:**

Montana FWP  
1420 E. Sixth Ave.  
PO Box 200701  
Helena, MT 59620-0701

**FWP Project Representative:**

Jason Senn, P.E.  
FWP Project Manager  
1522 9<sup>th</sup> Avenue  
Helena, MT 59620  
406-841-4007 (wk)  
406-431-4032 (cell)  
406-841-4004 (fax)

**Project Engineer:**

Nate Hagen, P.E., CFM  
201 Broadway Suite C  
Helena, MT 59601  
406-457-8252, Ext. 8319 (wk)

## 3. SITE INSPECTION

All Bidders should satisfy themselves as to the construction conditions by personal examination of the site described in this document. Bidders are encouraged to make any - investigations necessary to assess the nature of the construction and the difficulties to be encountered, see General Conditions, Article 3.

## 4. SOILS INFORMATION

Geotechnical investigation work has been completed for this Project. It is the responsibility of the Bidders to review and interpret all investigations, findings, and reports made part of this contract prior to bid preparation, see General Conditions, Article 3.

## 5. PROJECT REPRESENTATIVE, INSPECTIONS, AND TESTING

The Contractor's work will be periodically tested and observed to insure compliance with the Contract Documents. Complete payment will not be made until the Contractor has demonstrated that the work is complete and has been performed as required. If the Project Representative detects a discrepancy between the work and the requirements of the Contract Documents at any time, up to and including final inspection, such work will not be completely paid for until the Contractor has corrected the deficiency, see General Conditions, Article 9.

The Project Representative will periodically monitor the construction of work to determine if the work is being performed in accordance with the contract requirements. The Project Representative does not have the authority or means to control the Contractor's methods of construction. It is, therefore, the Contractor's responsibility to utilize all methods, equipment, personnel, and other means necessary to assure that the work is installed in compliance with the Drawings and Specifications, and laws and regulations applicable to the work. Any discrepancies noted shall be brought to the Contractor's attention, who shall immediately correct the discrepancy. Failure of the Project Representative to detect a discrepancy will not relieve the Contractor of his ultimate responsibility to perform the work as required, see General Conditions, Article 3.

The Contractor shall inspect the work as it is being performed. Any deviation from the Contract requirements shall be immediately corrected. Prior to any scheduled observation by the Project Representative, the Contractor shall again inspect the work and certify to the Project Representative that he has inspected the work and it meets the requirements of the Contract Documents. The Project Representative may require uncovering of work to verify the work was installed according to the contract documents, see General Conditions, Article 12.

The work will be subject to review by the Project Representative. The results of all such observations, and all contract administration, shall be directed to the Contractor only through the Project Representative.

5.1 Services Required by the Contractor. The Contractor shall provide the following services:

- a. Any field surveys to establish locations, elevations, and alignments as stipulated on the Contract Documents. FWP reserves the right to set preliminary construction staking for the project. The Contractor is responsible to notify FWP for any construction staking discrepancies.
- b. Preparation and certification of all required shop drawings and submittals as described in the General Conditions, Article 3.
- c. All testing requiring the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing laboratory acceptable to the Project Representative. The laboratory shall be staffed

with experienced technicians properly equipped, and fully qualified to perform the tests in accordance with the specified standards.

- d. Preparation and submittal of a construction schedule, including submittals, see General Conditions, Article 3. The schedule shall be updated as required, as defined in the Contract Documents.
- e. All Quality Control testing as required by the Contractor's internal policies.
- f. All Quality Assurance testing and/or re-testing as stated in the Contract Documents, see General Conditions, Article 13.

5.2 Services Provided by the Owner. The Owner shall provide the following services at no cost to the Contractor except as required for retests as defined in the Contract Documents.

- a. The Project Representative may check compaction of backfill and surfacing courses using laboratory testing submittal information supplied by the Contractor. These tests are to determine if compaction requirements are being fulfilled in accordance with the Contract Documents. It is ultimately the responsibility of the Contractor to insure that this level of compaction is constant and met in all locations.
- b. Any additional Quality Assurance testing deemed appropriate by the Owner, at the Owner's expense.

## **6. ENGINEERING INTERPRETATIONS**

Timely Engineering decisions on construction activities or results have an important bearing on the Contractor's schedule. When engineering interpretation affects a plan design or specifications change, it should be realized that more than 24 hours may be required to gain the necessary Owner participation in the decision process including time for formal work directive, or change order preparation as required.

## **7. REJECTED WORK**

Any defective work or nonconforming materials or equipment that may be discovered at any time prior to the expiration of the warranty period, shall be removed and replaced with work or materials conforming to the provisions of the Contract Documents, see General Conditions, Article 12. Failure on the part of the Project Representative to condemn or reject bad or inferior work, or to note nonconforming materials or equipment on the Contractor's submittals, shall not be construed to imply acceptance of such work. The Owner shall reserve and retain all its rights and remedies at law against the Contractor and its Surety for correction of any and all latent defects discovered after the guarantee period (MCA 27-2-208).

Only the Project Representative will have the authority to reject work which does not conform to the Contract Documents.



## 8. UTILITIES

The exact locations of existing utilities that may conflict with the work are not precisely known. It shall be the Contractor's responsibility to contact the owners of the respective utilities and arrange for field location services. **One Call Locators, 1-800-424-5555**

The Contract Documents may show utility locations based on limited field observation and information provided to the Project Representative by others. **The Project Representative cannot guarantee their accuracy.** The Contractor shall immediately notify the Project Representative of any discrepancies with utility locations as shown on the Contract Drawings and/or their bury depths that may in any way affect the intent of construction as scoped in these specifications.

There will be no separate payment for exploratory excavation required to locate underground utilities.

8.1 Notification. The Contractor shall contact, in writing, all public and private utility companies that may have utilities encountered during excavation. The notification includes the following information:

- a. The nature of the work that the Contractor will be performing.
- b. The time, date and location that the Contractor will be performing work that may conflict with the utility.
- c. The nature of work that the utility will be required to perform such as moving a power pole, supporting a pole or underground cable, etc.
- d. Requests for field location and identification of utilities.

A copy of the letter of notification shall be provided to the Project Representative. During the course of construction, the Contractor shall keep the utility companies notified of any change in schedule, or nature of work that differs from the original notification.

8.2 Identification. All utilities that may conflict with the work shall be the Contractor's responsibility to locate before any excavation is performed. Field markings provided by the utility companies shall be preserved by the Contractor until actual excavation commences. All utility locations on the Drawings should be considered approximate and should be verified in the field by the Contractor. The Contractor shall also be responsible for locating all utilities that are not located on the Drawings.

Utilities are depicted on the Contract Documents in accordance with their achieved "Quality Levels," as defined in the American Society of Civil Engineer's Document, ASCE 38, "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data." Reliance upon these data for risk management purposes during bidding does not relieve the Contractor, or

Utility Owner from following all applicable utility damage prevention statutes, policies, and/or procedures during construction. It is important that the Contractor investigates and understands the scope of work between the project Owner and Engineer regarding scope of limits of the utility investigations leading to these utility depictions. Definitions of Quality Levels are described as follows:

- a. "QUALITY LEVEL A" – (QLA): LOCATING THROUGH EXCAVATION. QLA data are highly accurate and are obtained by surveying an exposed utility. As such, both horizontal and vertical data are recorded. Survey accuracies are typically set at 15mm (1/2-inch) vertically, and to project survey standards horizontally (typically the same as for topography features), although these survey accuracies and precisions are generally left to the owner to specify in a scope of work. In addition to the applicable standard of care and any other additional standards imposed by commercial indemnity clauses, the accuracy of these location data is also typically guaranteed. Other data typically characterized include material type, surface elevation, utility size/capacity, outside dimensions, and configurations, soil type, and utility condition.
- b. "QUALITY LEVEL B" – (QLB): DESIGNATING. QLB information is obtained through the application of appropriate surface geophysical methods to identify the existence and approximate horizontal location of utilities (a utility's "designation") within the project limits, followed by survey, mapping, and professional review of that designation. Underground utilities are identified by interpretation of received signals generated either actively or passively, and through correlating these received signals with visible objects (QLC) and record data (QLD) to determine function. Designated utilities that can't be identified are labeled as "unknowns." Although approximate has no accuracy associated with it, generally the locations are within inches rather than feet. The more utility congested the area or the deeper the utilities, the less likely it is that the designations will achieve that accuracy. These designations are then surveyed to project accuracies and precisions, typically third-order accuracy similar to other topography features. Note that surveying existing one-call marks does not lead to QLB data, since the genesis of the marks was not under the direct responsible charge of the professional certifying the QLB depictions, and one-call generally does not address unknown utilities, privately owned utilities, utilities without records, abandoned utilities, and so on. Nor does the professional have knowledge of the field technician's qualifications, training, and level of effort.
- c. "QUALITY LEVEL C" – (QLC): SURFACE VISIBLE FEATURE SURVEY. QLC builds upon the QLD information by adding an independent detailed topography site survey for surface-visible

appurtenances of subsurface utilities including but not limited to fire hydrants, valves, risers, and manholes. Professional judgment is used to correlate the QLD data to the surveyed features, thus increasing the reliability of both utility location and existence. It is a function of the professional to determine when records and features do not agree and resolve discrepancies. This may be accomplished by depiction of a utility line at quality level D, effectively bypassing or disregarding (but still depicting) a surveyed structure of unknown origin. Additional resolution may result from consultation with utility owners.

- d. "QUALITY LEVEL D" – (QLD): EXISTING RECORDS RESEARCH. QLD is the most basic level of information. Information is obtained from the review and documentation of existing utility records, verbal accounts, and/or one-call markings (to determine the existence of major active utilities and their approximate locations).

- 8.3 Removal or Relocation of Utilities. All electric power, street lighting, gas, telephone, and television utilities that require relocation will be the responsibility of the utility owner. A request for extending the specified contract time will be considered if utility owners cause delays.
- 8.4 Public Utilities. Water, sewer, storm drainage, and other utilities owned and operated by the public entities shall, unless otherwise specifically requested by the utility owner, be removed, relocated, supported or adjusted as required by the Contractor at the Contractor's expense. All such work shall be in accordance with these Contract Documents, or the Owner's Standard Specifications or written instructions when the work involved is not covered by these Specifications.
- 8.5 Other Utilities. Utilities owned and operated by private individuals, railroads, school districts, associations, or other entities not covered in these Special Provisions shall, unless otherwise specifically requested by the utility owner, be removed, relocated, supported or adjusted as required by the Contractor at the Contractor's expense. All work shall be in accordance with the utility owner's directions, or by methods recognized as being the standard of the industry when directions are not given by the owner of the utility.
- 8.6 Damage to Utilities and Private Property. The Contractor shall protect all utilities and private property and shall be solely responsible for any damage resulting from his construction activities. The Contractor shall hold the Owner and Project Representative harmless from all actions resulting from his failure to properly protect utilities and private property. All damage to utilities shall be repaired at the Contractor's expense to the full satisfaction of the owner of the damaged utility or property. The Contractor shall provide the Owner with a letter from the owner of the damaged utility or property stating

that it has been repaired to the utility owner's full satisfaction.

- 8.7 Structures. The Contractor shall exercise every precaution to prevent damage to existing buildings or structures in the vicinity of his work. In the event of such damages, he shall repair them to the satisfaction of the owner of the damaged structure at no cost to the Owner.
- 8.8 Overhead Utilities. The Contractor shall use extreme caution to avoid a conflict, contact, or damage to overhead utilities, such as power lines, streetlights, telephone lines, television lines, poles, or other appurtenances during the course of construction of this project.
- 8.9 Buried Gas Lines. The Contractor shall provide some means of overhead support for buried gas lines exposed during trenching to prevent rupture in case of trench caving.
- 8.10 Pavement Removal. Where trench excavation or structure excavation requires the removal of curb and gutter, concrete sidewalks, or asphalt or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by use of a spade-bitted air hammer, concrete saw, colter wheel, or similar approved equipment to obtain a straight, square clean break. Pavement cuts shall be 2 feet wider than the actual trench opening.
- 8.11 Survey Markers and Monuments. The Contractor shall use every care and precaution to protect and not disturb any survey marker or monuments, such as those that might be located at lot or block corners, property pins, intersection of street monuments or addition line demarcation. Such protection includes markings with flagged high lath and close supervision. No monuments shall be disturbed without prior approval of the Project Representative. Any survey marker or monument disturbed by the Contractor during the construction of the project shall be replaced at no cost to the Owner by a licensed land surveyor.
- 8.12 Temporary Utilities. The Contractor shall provide all temporary electrical, lighting, telephone, heating, cooling, ventilating, water, sanitary, fire protection, and other utilities and services necessary for the performance of the work. All fees, charges, and other costs associated therewith shall be paid for by the Contractor.

## **9. CONSTRUCTION SAFETY**

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees and subcontractors) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable federal, state, county, and local laws, ordinances,

codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve them from compliance with the obligations and penalties set forth therein, see General Conditions, Article 10.

## **10. CONSTRUCTION LIMITS AND AREAS OF DISTURBANCE**

- 10.1 Construction Limits. Where construction easements or property lines, are not specifically called out on the Contract Documents, limit the construction disturbance to ten (10) feet, when measured from the edge of the slope stake grading, or to the adjacent property line, whichever is less. Disturbance and equipment access beyond this limit is not allowed without the written approval of both the Project Representative and the Owner of the affected property. If so approved, disturbance beyond construction limits shall meet all requirements imposed by the landowner; this includes existing roads used and/or improved as well as the construction of new access roads. Special construction, reclamation, or post-construction reclamation or other closure provisions required by the landowner on access roads beyond the construction limits shall be performed by the Contractor at no additional cost to the Owner.
- 10.2 Areas of Disturbances. Approved areas of disturbance are those areas disturbed by construction activities within the construction limits and along designated or approved access routes. Such areas may require reclamation and revegetation operations, including grading to the original contours, top soiling with salvaged or imported topsoil, seeding, fertilizing, and mulching as specified herein. Other areas that are disturbed by the Contractor's activities outside of the limits noted above will be considered as site damage or unapproved areas of disturbance, see General Conditions, Articles 3 and 10. This includes areas selected by the Contractor outside the defined construction limits for mobilization, offices, equipment, or material storage.

## **11. DECONTAMINATE CONSTRUCTION EQUIPMENT**

Power wash all construction equipment entering the project site to prevent the spread of noxious weeds and aquatic invasive species. This applies to all FWP projects, whether or not individual construction permits specifically address cleaning of equipment.

## **12. TREE PROTECTION AND PRESERVATION**

The Contractor and the Owner shall individually inspect all trees within the project construction limits prior to construction. The Owner shall determine which trees are to be removed and which trees are to be preserved. Construction of the grading, utilities and various roadway facilities must not significantly damage the trees root system or hinder it's chances for survival. Reasonable variations from the Contract Documents, as directed by the Project Representative, may be employed to ensure the survival of trees.

### **13. CONSTRUCTION SURVEYS**

The Contractor will be responsible for all layout and construction staking utilizing the Project Representative's existing control and coordinate data for the project. Dimensions and elevations indicated in layout of work shall be verified by the Contractor. Discrepancies between Drawings, Specifications, and existing conditions shall be referred to the Project Representative for adjustment before work is performed.

The Project Representative may set location and grade stakes prior to construction; however, it is ultimately the responsibility of the Contractor to check and verify all construction staking for the project.

Existing survey control (horizontal and vertical) has been set for use in the design and ultimately the construction of these improvements. A listing of the coordinates and vertical elevation for each of these control points may be included in the project drawings.

The Contractor will be responsible for preserving and protecting the survey control until proper referencing by the Contractor has been completed. Any survey control obliterated, removed, or otherwise lost during construction will be replaced at the Contractor's expense.

Contractor shall be aware of property pins and survey monuments. Damage to these pins will require replacement of such by a registered land surveyor at no cost to the owner.

The Contractor shall provide construction staking from the Contractor's layouts and the control points. Contractor's construction staking includes at a minimum:

1. Slope stakes located at critical points as determined by the Project Representative.
2. Blue tops every longitudinally and transversely for subgrade and crushed base to verify finish grading of course.
3. Location and grade stakes for drainage features and retaining walls.
4. Location stakes for roadside safety items, permanent and temporary traffic control, and misc. items as determined by the Project Representative.

Original field notes, computations and other records take by the Contractor for the purpose of quantity and progress surveys shall be furnished promptly to the Project Representative and shall be used to the extent necessary in determining the proper amount of payment due to the Contractor.

### **14. MATERIAL SOURCES AND CONSTRUCTION WATER**

The Contractor shall be responsible for locating all necessary material sources, including aggregates, earthen borrow and water necessary to complete the work. The Contractor shall be responsible for meeting all transportation and environmental regulations as well as paying any royalties. The Contractor shall provide the Project Representative with written approvals of landowners from whom materials are to be obtained, prior to approval.

The Contractor may use materials from any source, providing the materials have been tested through representative samples and will meet the Specifications.

Water for compaction efforts shall be supplied by the Contractor.

## **15. MATERIALS SALVAGE AND DISPOSAL**

Notify the Owner for any material salvaged from the project site not identified in the Contract Documents. The Owner reserves the right to maintain salvaged material at the project site, compensate the Contractor for relocation of salvaged material, or agreed compensation to Owner for material salvaged by the Contractor.

Haul and waste all waste material to a legal site and obey all state, county, and local disposal restrictions and regulations.

## **16. STORED MATERIALS**

Contractor shall use an approved storage area for materials. Materials and/or equipment purchased by the Contractor may be compensated on a monthly basis. For compensation, provide the Project Representative invoices for said materials, shop drawings and/or submittals for approval, and applicable insurance coverage, see General Conditions, Article 9.

## **17. STAGING AND STOCKPILING AREA**

Contractor shall use staging and stockpiling sites for to facilitate the project as approved by the Owner. Contract Documents may show approved staging and stockpiling locations. Notify Owner within 24 hours for approval of staging and stockpiling sites not shown on the Contract Drawings.

## **18. SECURITY**

The Contractor shall provide all security measures necessary to assure the protection of equipment, materials in storage, completed work, and the project in general.

## **19. CLEANUP**

Cleanup for each item of work shall be fully completed and accepted before the item is

considered final. If the Contractor fails to perform cleanup within a timely manner the Owner reserves the right to withhold final payment.

Review these Contract Documents for additional Final Cleanup specifications for specific measures, associated with Contractor responsibilities and final payment.

## **20. ACCESS DURING CONSTRUCTION**

Provide emergency access at all times within the project throughout the construction period.

## **21. CONSTRUCTION TRAFFIC CONTROL**

The Contractor is responsible for providing safe construction and work zones within the project limits by implementing the rules, regulations, and practices of the Manual on Uniform Traffic Control Devices, current edition.

## **22. SANITARY FACILITIES**

Provide on-site toilet facilities for employees of Contractor and Sub-Contractors and maintain in a sanitary condition.

## **23. CONTRACT CLOSEOUT**

The Contractor's Superintendent shall maintain at the project site, a "Record Set of Drawings" showing field changes, as-built elevations, unusual conditions encountered during construction, and such other data as required to provide the Owner with an accurate "as constructed" set of record drawings. The Contractor shall furnish the "Record Set" to the Project Representative following the Final Inspection of the Project.

The Contractor's final payment will not be processed until the "Record Set" of drawings are received and approved by the Project Representative.

## **24. MEASUREMENT AND PAYMENT**

Review these Contract Documents for additional Measurement and Payment specifications for definitions. Quantities are listed on the Bid Proposal for Payment Items. Additional material quantities, volumes, and measurements may be shown on the Contract Document drawings and/or specifications.

Unit Price quantities and measurements shown on the Bid Proposal are for bidding and contract purpose only. Quantities and measurements supplied, completed for the project, and verified by the Project Representative shall determine payment. Each unit



price will be deemed to include an amount considered by the Contractor to be adequate to cover Contractor's overhead and profit for each bid item.

The Owner or Contractor may make a Claim for an adjustment in Contract Unit Price if the quantity of any item of Unit Price Work performed by the Contractor differs materially and/or significantly (increase or decrease by 50%) from the estimated quantity indicated on the Bid Proposal.

Lump sum bid item quantities will not be measured. Payment for these lump sum bid proposal items will be paid in full amount listed on the Bid Proposal when accepted by the Project Representative, unless specified otherwise.

# Technical Specifications

# SPECIAL PROVISIONS

Rainbow Dam Overlook and Parking Lot Improvements  
Cascade County, Montana

Prepared for:

American Public Land Exchange  
460 Russell Lane  
Helena, Montana 59602

Prepared by:

Pioneer Technical Services  
201 E. Broadway, Suite C  
Helena, Montana 59601  
(406) 457-8252



February 2016

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## LIST OF DOCUMENT REVISIONS

Revision No.	Author	Version	Description	Date
Rev 0	NJH	1	Internal Review	8/16/15
Rev 1	NH, TR, MB	2	Client Review	8/17/15
Rev 2	NH,TR	3	Final For Bid	2/11/16
Rev 3				
Rev 4				

## SECTION III SPECIAL PROVISIONS

This section of the Contract Documents describes the Work required as shown on the Drawings. The Technical Specifications applicable to each component of the Project are referenced and the method of measurement and payment is identified. Refer to Montana Public Works Standard Specifications (MPWSS) current edition for any technical specifications not contained in the Special Provisions. All Special Provisions are identified. For any discrepancies between the Special Provisions and the Technical Specifications, the Special Provisions will govern.

### 1. PROJECT DESCRIPTION

The Rainbow Dam Overlook is located on Giant Springs Road approximately 1 mile east of the Giant Springs State Park Entrance, Great Falls, Montana, Cascade County, Section 34, Township 21 North, Range 4 East.

This project is intended to stabilize the parking lot and lookout from a landslide encroaching into the site. Pioneer completed a subsurface investigation of the area in March of 2014 and concluded that measures should be taken to unload and stabilize the slope.

This project consist of removing a portion of the existing asphalt parking lot, removing approximately 5 feet of native soils underneath the asphalt and adjacent to the look out, salvaging and replacing existing fence and landscaping boulders, installing new asphalt, and installing trench drains. Contractor will complete all work as shown on the Drawings and described in the Special Provisions and Technical Specifications.

Project-Related Contacts. The Contractor shall schedule and coordinate Work as necessary with the Owner to complete the Work in accordance with contract agreements and Owner specified schedule.

Owner	Montana Fish Wildlife and Parks 1522 9 <sup>th</sup> Avenue PO Box 200701 Helena, MT 59620-0701	Land Owner	NorthWestern Energy David Krueger 336 Rainbow Dam Road Great Falls, Montana 59404
Engineer	Nate Hagen Pioneer Technical Services, Inc. 201 East Broadway Suite C Helena, MT 59601 406-457-8252		



## 2. UNDERGROUND UTILITIES

The exact locations of existing underground utilities that may conflict with the work are not precisely known. Locations of existing utilities shown on the plans are based on a combination of maps and information provided by utility Owners, location services provided by One-Call Utility Locators, and from limited field inspection. Actual utility locations, materials, and size may vary from the information shown on the plans. There is a possibility of the presence of additional underground utilities not shown on the Drawings, including but not necessarily limited to, telephone, cable television, and electrical service lines. It shall be the **Contractor's responsibility** to contact the owners of the respective utilities and arrange for field location services.

## 3. CONSTRUCTION MANAGEMENT/PROJECT CONTROL

General. The Contractor shall hold a Certificate of Contractor's Registration Number from the State of Montana.

The Contractor will provide an on-site construction superintendent to monitor the conformance of the construction to the requirements of the approved drawings and specifications. The on-site superintendent shall keep a written record of his field observations, including materials incorporated into the work. Contractor shall also appoint a lead man on each work crew; the lead man will have the responsibility to communicate with the Engineer regarding that crew's work.

The Contractor shall review his Subcontractor's requests for payment and shall verify that the pay requests reflect the amount of work completed and approved in accordance with the Contract Documents. The Contractor shall submit the approved payment requests to the Engineer.

The Contractor shall hold progress meetings with the Owner and Engineer on at least a weekly basis and provide written progress updates on a more frequent basis if necessary. The Contractor shall be responsible for reviewing submittals as outlined in the Contract Documents and ensure that all project records, submittals, test reports, and pay requests are furnished to all agencies involved in the project.

Selection of Construction Subcontractor(s). The Contractor shall be responsible for Subcontracting the services of qualified Subcontractor(s) to perform the required construction services as outlined in the Contract Documents. The Subcontractor(s) shall be experienced in the types of construction methods required by this Contract, shall hold a Montana Public Contractor's License of the class necessary to cover all the value of the Contract, and shall be responsible for providing the required bonding and insurance for this Contract. The Subcontractor(s) shall also be subject to the requirements of the Contract Documents. Subcontractors shall provide to the Contractor certified payroll documentation. Contractor shall review and assure all Subcontractors' payroll is in accordance with the Contract. Contractor shall submit copies of all Subcontractors' certified payroll to the Engineer.

Project Control. At the beginning of the project, Contractor shall provide a written, detailed schedule for completing the project within the contract time. This schedule shall consider



material delivery, equipment availability, installation requirements, and other factors impacting the schedule.

Incidentals. The following does not necessarily name all the incidental items required by the Contract Documents to complete the work. The cost of all such incidentals, including all required surveying, staking, labor, tools, equipment, materials, connections, temporary utilities, de-watering, bypass flow or pumping, testing, cleanup and repairs, and quality control testing shall be included in the various bid items. Final payment will not be made until the entire all Work is completed and operable as specified and shown on the Plans.

Change Orders. All change orders and submitted invoices will be reviewed and approved by Montana Fish, Wildlife and Parks prior to being processed.

## **4. DESCRIPTION OF INDIVIDUAL BID ITEMS:**

The Work, methods of measurement, and methods of payment for each Bid Item are stated in this section. Technical Specifications and Drawings are listed for each Bid Item as a convenience to Contractor. Contractor shall complete all Work under the Contract in accordance with the Special Provisions, Technical Specifications and Drawings, in their entirety. Contractor shall perform the Work described below:

### **BID ITEM 1. MOBILIZATION, DEMOBILIZATION, BONDING AND INSURANCE**

#### **Work Description:**

The Work includes those actions necessary for transporting and moving personnel, equipment, supplies, and incidentals to and from the project area; obtaining necessary permits; establishing all offices and facilities necessary for work on the project area; obtaining and submitting contract bonds and insurance; submitting and obtaining approval of all preconstruction submittals specified in the Specifications, Special Provisions, Submittals, and for other Work and operations that must be performed or costs incurred before beginning work at the project area. Mobilization costs for subcontracted Work shall be included in this Bid Item. Administration, bonding, insurance, and preparation of project area documents shall be included in mobilization. This Bid Item applies to all Work as described in these Special Provisions.

**No littering will be allowed.** Contractor shall provide and maintain suitable garbage receptacles at the staging areas and other locations within the project area as appropriate. The garbage receptacles shall be covered and physically secured to prevent loss of contents by weather or wildlife. Bear-proof receptacles will be required. Contractor shall empty the garbage receptacles as needed and ensure that the garbage is properly disposed. Contractor shall inform employees and Subcontractors of the locations of the garbage receptacles, instruct them not to litter, and require that all garbage generated on the Site is disposed of properly.

Contractor shall set up the facilities, maintain them during construction, and dismantle them at the end of the Project.



Site Security: Contractor is responsible for Site security and shall retain security personnel or implement other security measures at Contractor's own discretion and expense. No itemized payment will be made for Site security under this Contract. Any losses occurring as a result of a security breach are the responsibility of Contractor.

Good Housekeeping and Material Handling: Contractor shall take all reasonable precautions to prevent pollution of air, soil and water associated with the construction activities. Contractor shall develop and comply with their Environmental Protection Plan.

Contractor shall be responsible for hazardous material containment and cleanup for all materials including motor oil, hydraulic and transmission fluid, antifreeze, brake fluid, and all other materials and chemicals used in the maintenance of equipment and machinery. **Contractor shall immediately notify Engineer and the Northwestern Energy Hydro Rainbow Generation Control Center at 406-268-2300 of any spill(s) that occur on NWE property within the project boundary.** Fuel, oil, grease, and other such materials shall be stored in one location within the staging areas. All materials shall be stored in a bermed plastic-lined (minimum of 30 mil) storage area with a capacity of 110 percent of the volume of all combined containers. Absorbent material shall be available on the Site for cleanup of any spills from the start of mobilization until all demobilization is complete.

Contractor shall remove from the project area, all refuse resulting from use, servicing, or repair of equipment. Contractor shall remove any non-functioning equipment that will not be repaired on the Site within five (5) days of breakdown. All trash and debris shall be removed and disposed of at a state-licensed solid waste management facility.

Road Protection and Maintenance: Contractor shall take all necessary precautions to prevent damage to roads located outside of the project area. Contractor shall repair any damage caused by Contractors traffic at no additional cost to Owner.

Materials: Contractor shall identify a safe area for delivery and storage of all materials. This area must be approved by Engineer. Contractor shall store and prevent mixture of stockpile materials (i.e., topsoil, subsoil, aggregates, mine wastes, etc.) used for the Work. Contractor shall store miscellaneous materials required for the Work as recommended by the supplier or as required in the Contract Documents. Contractor shall replace damaged materials at no additional cost to Owner.

Fire Protection: If fire conditions at the site are at or above moderate risk, Contractor shall have a minimum of 1 water truck available during all times that work is being completed in the project area. The water trucks for fire suppression shall be capable of providing a minimum of 1,000 gallons at 100 gallons per minute at sufficient pressure to accomplish fire control. Equip the water trucks with generators, pumps and at least 100 feet of hoses with nozzles suitable for fighting fires and controlling any burning activities.

**Work Included:**

- Mobilize and demobilize to and from the project area with all necessary equipment to complete the Work.



- Obtain insurance and bonding for the Contract, and provide copies to Owner.
- Obtain all required permits, and provide copies to Engineer.
- Prepare and submit all preconstruction submittals to Engineer for approval.
- Provide and remove temporary offices and storage, trash, and sanitation facilities.
- Provide site security.
- Provide fire protection.
- Dispose all trash and debris generated by Contractor at a state-licensed solid waste management facility.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

#### **Measurement Bid Item 1**

No measurement for Bid Item 1. Mobilization, Demobilization, Bonding and Insurance will be made.

#### **Payment Bid Item 1**

Payment for Bid Item 1. Mobilization, Demobilization, Bonding and Insurance will be based on the lump sum price bid as shown on the Bid Form of the Contract Documents. Fifty percent (50%) payment for this Bid Item will be allowed once Contractor submits Bond and Insurance Certificates, fully mobilizes to the project area, and obtains approval on all submittals required prior to beginning Work. Full payment for this item will be allowed after Contractor completes the Work for the remainder of the Contract, completes final cleanup work, and fully demobilizes equipment and materials from the project area. **The Bid price for this item must not exceed ten percent (10%) of the total Bid price.**

### **BID ITEM 2. REMOVE AND DISPOSE OF EXISTING ASPHALT CONCRETE PAVEMENT**

#### **Work Description:**

The work consists of removing and disposing of existing asphalt concrete pavement designated for removal in the contract documents. Remove and dispose of existing asphalt concrete pavement shall be conducted as described in MPWSS Sixth Edition, Section 02112. Remove and dispose of asphalt concrete materials off-site. Conduct all excavation and embankment construction in accordance with MPWSS and OSHA regulations (most current Editions).

#### **Work Included:**

- Locating and Preserving existing utilities;
- Saw cutting existing asphalt concrete as shown on the drawings;
- Excavating as required to remove asphalt concrete;
- Removal and Disposal of asphalt concrete pavement as shown on the Drawings or as directed by Owner;
- All labor, tools, equipment, materials, and incidentals.

### **Measurement Bid Item 2**

Measurement for Bid Item 2 Measurement shall be by the area in square yards.

### **Payment Bid Item 2**

Payment for Bid Item 2 will be based on the unit price bid per square yard as shown on the Bid Form.

## **BID ITEM 3. REMOVE AND SALVAGE EXISTING FENCE**

### **Work Description:**

Contractor shall remove and salvage existing fence as shown on the contract drawings. Preserve all fences that are to remain in place. Should any such fence be moved for the contractor's convenience, permanently reinstall the fence after work is complete. Assume responsibility for any damage to such fence. No extra compensation will be allowed for preserving, removing or replacing fence designated to remain in place, since this work is considered incidental to the contract unit prices for the various items of the contract.

Contractor is wholly responsible for any damage to fence during removal and salvage. No separate payment shall be allowed for fence damaged during removal or salvage.

### **Work Included:**

- Remove existing fence as required to complete work.
- Salvage and temporarily store existing fence until it ready to be installed.
- Replace any fence damaged during construction activities.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

### **Measurement Bid Item 3**

Measurement shall be by the lineal foot.

### **Payment Bid Item 3**

Payment for Bid Item 3 will be based on the unit price bid per lineal foot as shown on the Bid Form.

## **BID ITEM 4. REMOVE AND SALVAGE LANDSCAPE BOULDERS**

### **Work Description:**

Contractor shall remove and salvage existing landscape boulders as shown on the contract drawings. Preserve all landscape boulders that are to remain in place. Should any such landscape boulder be moved for the contractor's convenience, permanently reinstall the landscape boulder after work is complete. Assume responsibility for any damage to such landscape boulder. No

extra compensation will be allowed for preserving, removing or replacing boulders designated to remain in place, since this work is considered incidental to the contract unit prices for the various items of the contract.

Contractor is wholly responsible for any damage to boulders during removal and salvage of landscape boulders. No separate payment shall be allowed for boulder damaged during removal and salvage of landscape boulders.

**Work Included:**

- Remove existing landscape boulders as required to complete work.
- Salvage and temporarily store existing landscape boulders until it ready to be installed.
- Replace any landscape boulders damaged during construction activities.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 4**

Measurement will be by the actual number of landscape boulders, removed and salvaged as counted by Engineer.

**Payment Bid Item 4**

Payment will be based on the unit price bid for each landscape boulders removed and salvaged as shown on the Bid Form.

**BID ITEM 5. STRIP AND STOCKPILE TOPSOIL (1')**

**Work Description:**

This item will include stripping topsoil to a depth of 1' from the project areas and stockpiling it in a separate area approved by the Engineer and Owner.

**Work Included:**

- Stripping topsoil from work areas to a minimum depth of 1'
- Stockpiling topsoil at a location approved by the Owner and Engineer.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 5**

Measurement will be by the cubic yard.

**Payment Bid Item 5**

Payment will be based on the cubic yard bid as shown on the Bid Form.



## **BID ITEM 6. REMOVE AND DISPOSE OF OVERBURDEN MATERIAL**

### **Work Description:**

The work consists of removing and disposing of overburden material to a depth of 5' as shown on the drawings. Remove and dispose overburden material off-site. Conduct all excavation embankment construction in accordance with MPWSS and OSHA regulations (most current Editions).

### **Work Included:**

- Locating and Preserving existing utilities;
- Excavating as required to remove overburden material to a depth of 5'
- Removal and Disposal of overburden material as shown on the Drawings or as directed by Owner;
- All labor, tools, equipment, materials, and incidentals.

### **Measurement Bid Item 6**

Measurement will be by the cubic yard as measured by a before and after topographic survey.

### **Payment Bid Item 6**

Payment will be based on the cubic yard bid as shown on the Bid Form.

## **BID ITEM 7. REPLACE TOPSOIL**

### **Work Description:**

This item will include replacing topsoil on all areas disturbed by construction activities to a uniform, minimum depth of 1'. This item shall also cover wasting any excess topsoil not placed on the disturbed areas as directed by the Engineer or importing topsoil as required to achieve 1' of cover.

### **Work Included:**

- Placing topsoil on the area disturbed by construction and any other disturbed areas;
- Wasting excess topsoil as directed by the Engineer
- All labor, tools, equipment, materials, royalties, and incidentals necessary to complete the work as specified.

### **Measurement Bid Item 7**

Measurement will be by the cubic yard.

### **Payment Bid Item 7**

Payment will be based on the cubic yard bid as shown on the Bid Form.

## **BID ITEM 8. RE-INSTALL SALVAGED FENCE**

### **Work Description:**

Contractor shall re-install existing fence as shown on the contract drawings. Preserve all fences that are to remain in place. Should any such fence be moved for the contractor's convenience, permanently reinstall the fence after work is complete. Assume responsibility for any damage to such fence. No extra compensation will be allowed for preserving, removing or replacing fence designated to remain in place, since this work is considered incidental to the contract unit prices for the various items of the contract.

Contractor is wholly responsible for any damage to fence during replacement. No separate payment shall be allowed for fence damaged during replacement.

Contractor shall dispose of any fence removed and not replaced as part of this contract. Disposal is considered incidental to this bid item and no separate payment will be made for disposal of remaining fence.

### **Work Included:**

- Re-install salvaged fence at the location shown on the drawings.
- Replace any fence damaged during construction activities.
- Dispose of excess fence not replaced.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

### **Measurement Bid Item 8**

Measurement shall be by the lineal foot of fence salvaged and re-installed.

### **Payment Bid Item 8**

Payment for Bid Item 3 will be based on the unit price bid per lineal foot as shown on the Bid Form.

## **BID ITEM 9. RE-INSTALL SALVAGED LANDSCAPE BOULDERS**

### **Work Description:**

Contractor shall re-install existing landscape boulders as shown on the contract drawings. Preserve all landscape boulders that are to remain in place. Should any such landscape boulder be moved for the contractor's convenience, permanently reinstall the landscape boulder after work is complete. Assume responsibility for any damage to such landscape boulder. No extra compensation will be allowed for preserving, removing or replacing boulders designated to



remain in place, since this work is considered incidental to the contract unit prices for the various items of the contract.

Contractor is wholly responsible for any damage to boulders during removal, salvage and replacement. No separate payment shall be allowed for boulder damaged during removal, salvage or replacement.

**Work Included:**

- Re-install salvaged landscape boulders at the location shown on the drawings.
- Replace any landscape boulders damaged during construction activities.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 9**

Measurement will be by the actual number of landscape boulders re-installed as counted by Engineer.

**Payment Bid Item 9**

Payment will be based on the unit price bid for each landscape boulders re-installed as shown on the Bid Form.

**BID ITEM 10. INSTALL ASPHALT CONCRETE PAVEMENT**

*Subgrade Preparation:* Contractor shall strip and stockpile existing topsoil to minimum depth of 1-foot in the areas to receive asphalt concrete pavement. Topsoil shall be placed in the topsoil stockpile and spread on disturbed areas under bid items 5 and 7.

*Slope and Drainage Grading:* Contract shall perform necessary excavation and grading to bring subgrade to required grade. Compact subgrade to attain 95 percent of Standard Proctor maximum dry density (ASTM D 698/AASHTO T-99), at  $\pm 4$  percent optimum moisture content.

*Crushed Base Material (9"):* Contactor shall supply, grade and compact crushed aggregate base course meeting the following gradation:

Sieve (inches)	Specification (% Passing)
2	100
1	60 - 80
No. 4	20 - 50
No. 10	--
No. 200	8 max.
1. The liquid limit shall not exceed 25 and the plastic index shall not exceed 6.	
2. The L.A. Abrasion wear factor shall not exceed 50 percent at 500 revolutions.	

3. The portion of material passing the No. 200 sieve shall not be greater than two-thirds of that portion passing the No. 40 sieve.

Place crushed base material to minimum depth of 9-inches. Compact crushed base material using vibratory compaction equipment to attain 95 percent of Standard Proctor maximum dry density (ASTM D 698/AASHTO T-99), at  $\pm 4$  percent optimum moisture content.

*Asphalt Concrete Pavement (3")*: Furnish Type B commercial plant mix pavement over the compacted crushed top surfacing material as shown on the Drawings to minimum depth of 3-inches. Binder shall be rated PG-58-28 or higher. All asphalt pavement shall meet the requirements of MPWSS Sixth Edition, Section 02510. The average density shall be equal to or greater than 93 percent of the maximum density as determined by ASTM D2041 and no individual sample shall be less than 92 percent of maximum density.

**Work Included 10:**

- Strip and stockpile topsoil to a minimum depth of 1-foot.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.
- Excavate and grade as required to achieve lines and grades shown in plans.
- Compact subgrade.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.
- Supply and install Crushed Base Course to uniform, minimum depth of 9-inches
- Grade as required to achieve lines and grades shown on the plans.
- Compact Crushed Base Course
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.
- Supply and install Asphalt Pavement to minimum depth of 3-inches
- Grade as required to achieve lines and grades shown on the plans.
- Compact Asphalt Concrete Pavement
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 10**

Measurement will be by the lump sum.

**Payment Bid Item 10**

Payment will be based on the lump sum bid as shown on the Bid Form.

**BID ITEM 11. PAINT PARKING LINES**

**Work Description:**



This item will include supplying and installing white acrylic latex parking lines as shown on the drawings. All paint shall meet the requirements of MPWSS Sixth Edition, Section 02581.

**Work Included:**

- Preparation for parking line painting
- Supplying and applying white acrylic latex paint as shown on the drawings
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 11**

Measurement will be by the lump sum.

**Payment Bid Item 11**

Payment will be based on the lump sum bid as shown on the Bid Form.

**BID ITEM 12. RESEED OVERBURDEN AND SOUTH PIPE AREA**

**Work Description:**

The work consists of seeding and fertilizing all disturbed and top soiled areas. Follow the requirements and specifications of MPWSS Section 02910 and 02920 except as modified below.

Utilize the following seed mix:

SPECIES	PERCENT OF MIXTURE
Western Wheatgrass	38%
Green Needle Grass	12%
Secar Bluebunch	6%
Slender Wheatgrass	12%
Sodar Streambank	8%
Thickspike Wheatgrass	12%
Blue Gramma	12%

Broadcast seed at a rate of 24 lbs/acre on slopes of 1:1 and greater.

Drill seed at a rate of 12 lbs/acre on slopes less than 1:1.

Provide a standard commercial fertilizer containing percentages of total Nitrogen, available phosphoric acid, and water soluble potash as determined by the seed supplier.

Seeding shall occur in the fall as approved by the Engineer.

**Work Included:**

- Reseeding top-soiled areas and all other disturbed areas;
- Initial watering of seeded areas as required by the standard specifications;
- All labor, tools, equipment, materials, and incidentals necessary to complete the work as specified.

**Measurement Bid Item 12**

Measurement for Bid Item 12 Measurement shall be by the area in square yards.

**Payment Bid Item 12**

Payment for Bid Item 12 will be based on the unit price bid per square yard as shown on the Bid Form.

**BID ITEM 13. INSTALL NORTH DRAINS**

**Work Description Bid Item 13:**

*Excavation:* Contractor shall excavate as shown to lines and grades on the plans as necessary to install drains. Conduct all excavation embankment construction in accordance with MPWSS and OSHA regulations (most current Editions). The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the responsibility of the Contractor. The trench volume is approximately 1,110 cy by neat line. Any over-excavation required to complete the work is considered incidental to this work.

*4" HDPE Perforated Pipe:* Contractor shall install 4-inch HDPE perforated pipe having a minimum 100 psi rating. Place continuous non-woven geotextile (minimum Geotex 401 or approved equal) envelope around pipe prior to backfilling. Install pipe at a grade such that drainage is maintained to the outlet.

*Sand:* Contractor shall supply and install ASTM C-33 Concrete Sand as shown on the drawings.

*Backfill:* Backfill with native soils to lines and grades shown on the plans. Compact the native soil to a minimum of 90% of the standard proctor in 8-inch maximum loose lifts using only static compaction methods.

*Riprap and Drain Gravel:* Place 4-inch minus angular riprap and angular 3/4-inch minus washed rock (drain rock) at the outlet of the 4-inch HDPE perforated pipe. Install riprap, drain rock and sand in accordance with the Drawings.

*Geogrid:* Furnish and install geogrid meeting or exceeding Tensar TX140 or Gridpro BXPII Type I. Place geogrid at the lines and grades as shown on the drawings.

**Work Included 13:**

- Excavate to lines and grades as shown on the plans to construct the trench drains.
- Locating and Preserving existing utilities
- Clearing and grubbing;
- Stripping topsoil and stockpiling;
- Dewatering;
- Sheeting, shoring, bracing, shielding, and all other trench support necessary to complete the trench drains;
- Provide and install 4" HDPE perforated pipe and continuous non-woven geotextile fabric envelope around the pipe
- Provide and install ASTM C-33 Concrete Sand to the depth and grades as shown on the plans.
- Backfill, compact and grade stockpiled material as required to construct Trench Drains
- Provide and install riprap and drain rock at the outlets of the 4" HDPE perforated pipes
- Provide and install Geogrid as shown on the plans.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 13**

Measurement will be by the lump sum.

**Payment Bid Item 13**

Payment will be based on the lump sum bid as shown on the Bid Form.

**BID ITEM 14. INSTALL SOUTH DRAIN**

**Work Description Bid Item 14:**

*Excavation:* Contractor shall excavate as shown to lines and grades on the plans as necessary to install drains. Conduct all excavation embankment construction in accordance with MPWSS and OSHA regulations (most current Editions). The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the responsibility of the Contractor. The trench is approximately 05 cy by the neat line. Any over-excavation required to complete the work is considered incidental to this work.

*4" HDPE Perforated Pipe:* Contract shall install 4-inch HDPE perforated pipe having a minimum 100 psi rating. Place continuous non-woven geotextile (minimum Geotex 401 or approved equal) envelope around pipe prior to backfilling. Install pipe at a grade such that drainage is maintained to the outlet.

*Sand:* Contactor shall supply and install ASTM C-33 Concrete Sand as shown on the drawings.

*Backfill:* Backfill with native soils to lines and grades shown on the plans. Compact the native soil to a minimum of 90% of the standard proctor in 8-inch maximum loose lifts using only static



compaction methods. Install 6 mill polyethylene plastic in the trench as shown on the drawings prior to backfilling.

*Riprap and Drain Gravel:* Place 4-inch minus angular riprap and angular ¾-inch minus washed rock (drain rock) at the outlet of the 4-inch HDPE perforated pipe. Install riprap, drain rock and sand in accordance with the Drawings.

*Geogrid:* Furnish and install geogrid meeting or exceeding Tensar TX140 or Gridpro BXP11 Type I. Place geogrid at the lines and grades as shown on the drawings.

**Work Included 14:**

- Excavate to lines and grades as shown on the plans to construct the trench drains.
- Locating and Preserving existing utilities
- Clearing and grubbing;
- Stripping topsoil and stockpiling;
- Dewatering;
- Sheeting, shoring, bracing, shielding, and all other trench support necessary to complete the trench drains;
- Provide and install 4" HDPE perforated pipe and continuous non-woven geotextile fabric envelope around the pipe
- Provide and install ASTM C-33 Concrete Sand to the depth and grades as shown on the plans.
- Backfill, compact and grade stockpiled material as required to construct Trench Drains
- Provide and install polyethylene plastic as shown on the drawings
- Provide and install riprap and drain rock at the outlets of the 4" HDPE perforated pipes
- Provide and install Geogrid as shown on the plans.
- Provide all labor, tools, equipment, materials, and incidentals necessary to complete the Work as specified.

**Measurement Bid Item 14**

Measurement will be by the lump sum.

**Payment Bid Item 14**

Payment will be based on the lump sum bid as shown on the Bid Form.

# Rainbow Dam Monitoring Update

November 13, 2015

Ms. Nancy Johnson  
American Public Land Exchange  
Via email: [nancyjohnsonaple@mt.net](mailto:nancyjohnsonaple@mt.net)

**RE: Rainbow Dam Overlook Status Update**

Dear Ms. Johnson;

Pioneer Technical Services Inc. (Pioneer) performed a site visit on November 6, 2015 to measure inclinometers and piezometers installed at the Rainbow Dam Overlook site. The site visit was initiated in response to observances by Mr. Jason Pignanelli (Montana State Parks) of recent movement/slumping near the viewing platform. This purpose of this letter is to summarize our observations of the site to date.

**Background**

In 2014, Pioneer performed a geotechnical investigation at the site to help define the limits of an active landslide approaching the overlook. Four boreholes (BH) were drilled around the head scarp of the landslide and a slope inclinometer was installed in each borehole. Nested piezometers were installed adjacent to each borehole. The attached Figure 1 shows the location of the boreholes.

**Inclinometer Readings**

Inclinometers 1 and 2 show continual small scale movement. A summary of the inclinometers is listed below.

- Inclinometer 1 is installed in BH-01 directly above the head scarp of the landslide. Inclinometer 1 has displayed movement each monitoring period and has a cumulative displacement of about 0.4 inches. Movement initiates near the 9 foot depth and is oriented in a northeastern direction.
- Inclinometer 2 is installed in BH-02 and has also displayed movement each monitoring period. Movement initiates near the 7 foot depth and is oriented in an eastern direction.
- Inclinometer 3 is installed in BH-03. No significant movement has been observed.
- Inclinometer 4 is installed in BH-04. No significant movement has been observed.

Inclinometer charts displaying movement versus depth for each measurement are included in Attachment A.

**Piezometer Readings**

All piezometers measured on November 6, 2015 were dry. Table 1 lists piezometer measurements (depth to groundwater) recorded to date.

Table 1: Piezometer Measurements

Piezometer Nested Piezo #	P-01		P-02		P-03		P-04		
	A	B	A	B	#1	#2	A	B	C
3/12/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
3/26/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
5/22/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	14.88	Dry
6/11/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	14.88	Dry
7/29/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	14.83	Dry
9/29/2014	Dry	Dry	Dry	6.68	Dry	Dry	Dry	15.06	Dry
11/5/2014	Dry	Dry	Dry	7.08	Dry	Dry	Dry	Dry	Dry
6/5/2015	Dry	Dry	Dry	7.23	Dry	Dry	Dry	13.73	Dry
11/6/2015	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Note: 1) Piezometer P-01 corresponds to BH-01, P-02 to BH-02, P-03 to BH-03, and P-04 to BH-04.

### Summary

Pioneer anticipates that continued slope sloughing will occur at the Rainbow Dam Overlook. To date, the sloughing has been at a relatively slow pace and has not reached the existing Overlook facility. Freeze thaw cycles throughout the winter and/or large precipitation events may accelerate the sloughing.

If you have any questions regarding this report, please contact Mike Browne at 406-723-1917.

Sincerely,  
PIONEER TECHNICAL SERVICES, INC.



Mike Browne, P.E.  
Geotechnical Engineer





Photo 1 | Landslide relative to lookout, looking northwest.



Photo 2 | Landslide relative to lookout, looking southeast.

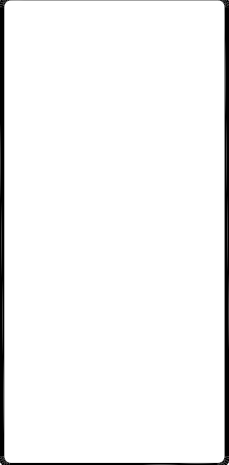
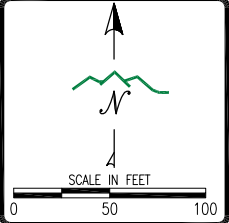




REVISION:		
DATE:	BY:	DESC:

DRAWN BY: JAL  
DESIGNED BY:    
CHECKED BY:    
APPROVED BY:    
PROJECT NO:    
DATE: 06-02-14

DISPLAYED AS:  
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DATUM: NAD 83  
UNITS: FEET  
SOURCE: PIONEER



RAINBOW DAM  
OVERLOOK

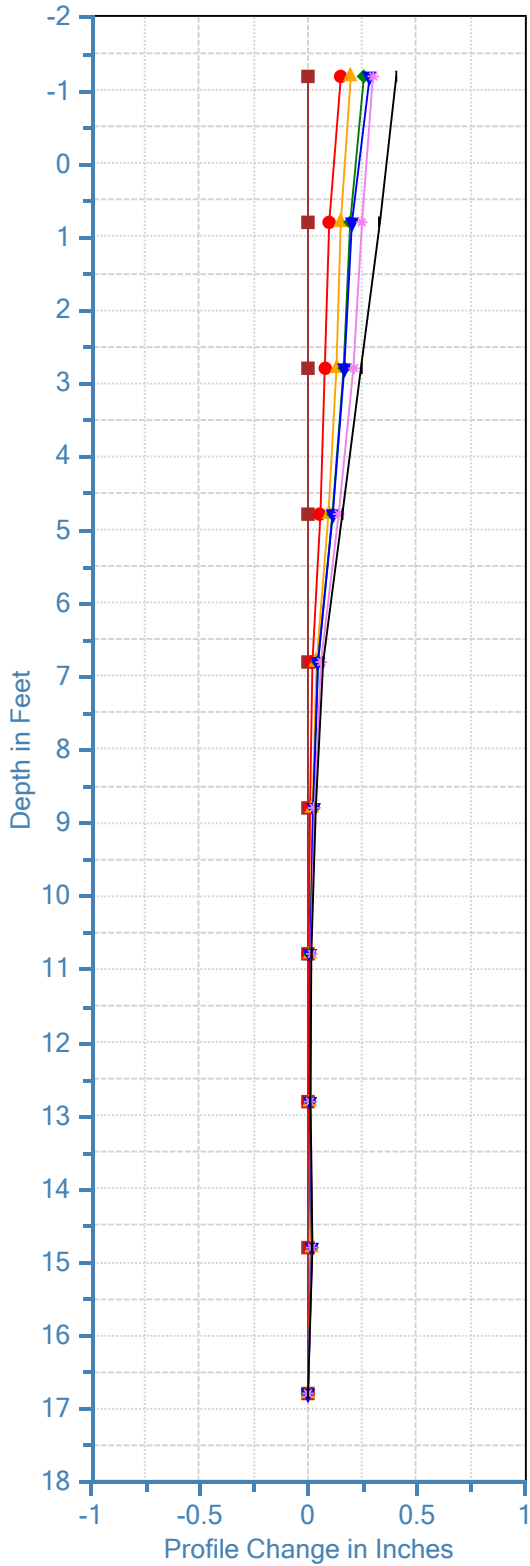
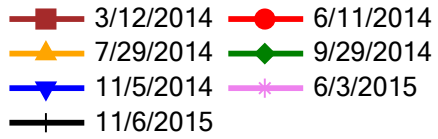
**PIONEER**  
TECHNICAL SERVICES, INC.  
201 E. BROADWAY, SUITE C  
HELENA, MT 59601  
(406) 457-8252

SHEET  
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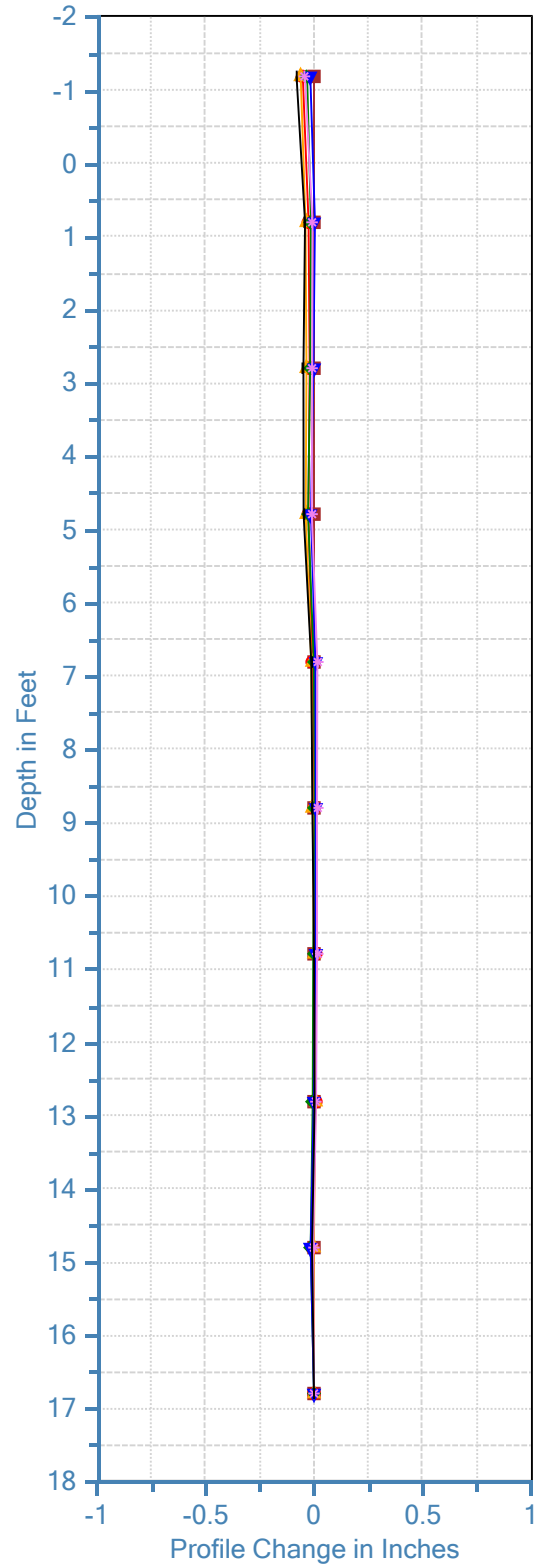
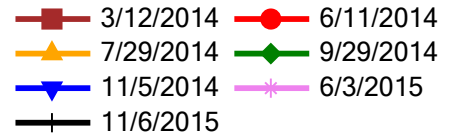


## ATTACHMENT A – INCLINOMETER CHARTS

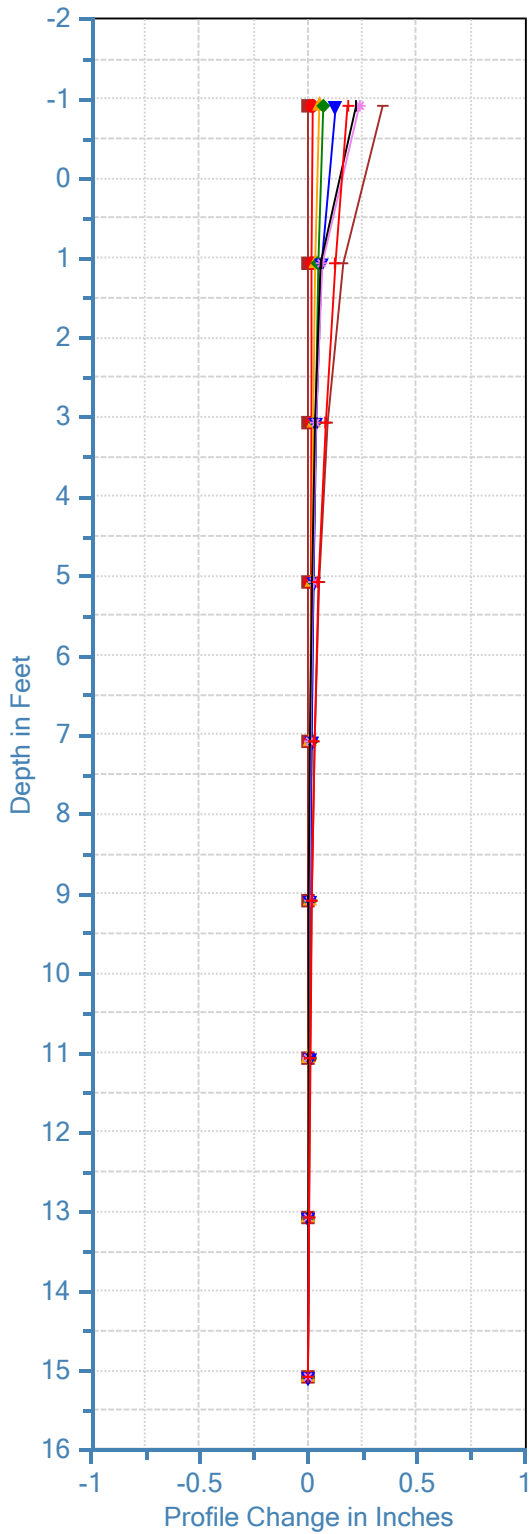
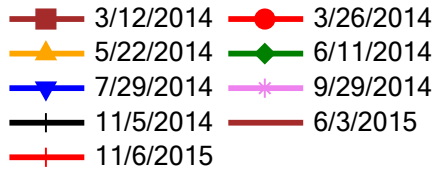
RAINB B1, A-Axis



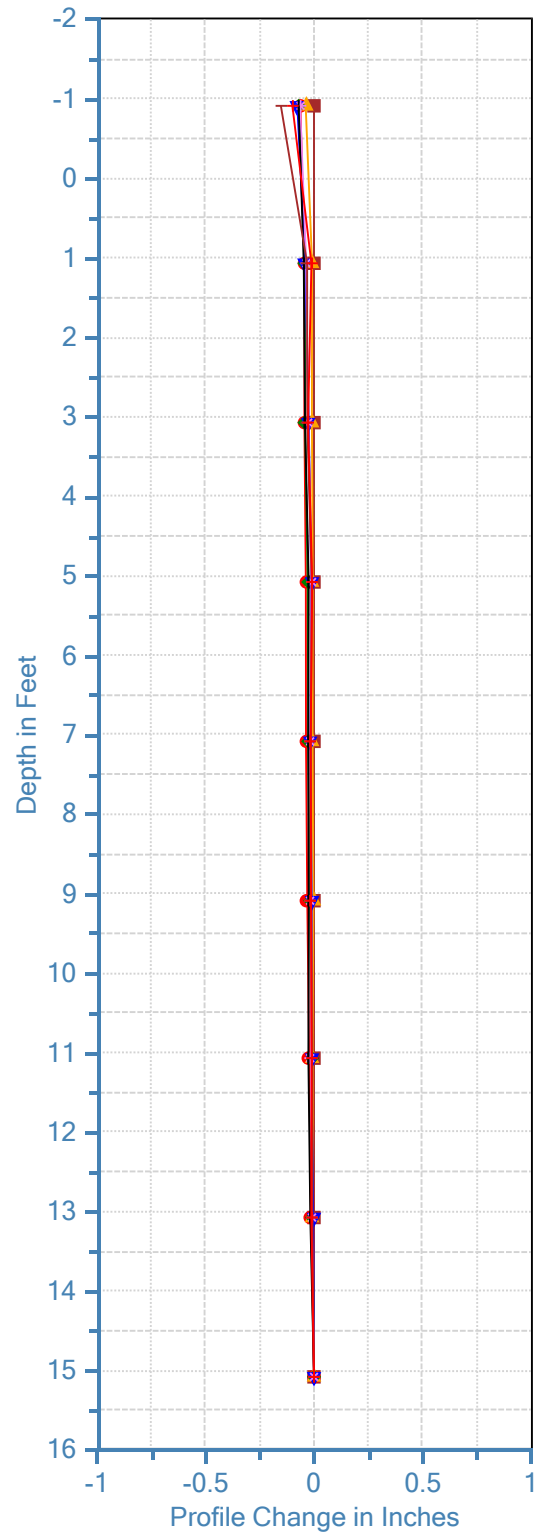
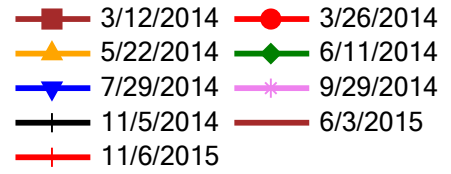
RAINB B1, B-Axis



RAINB 2, A-Axis

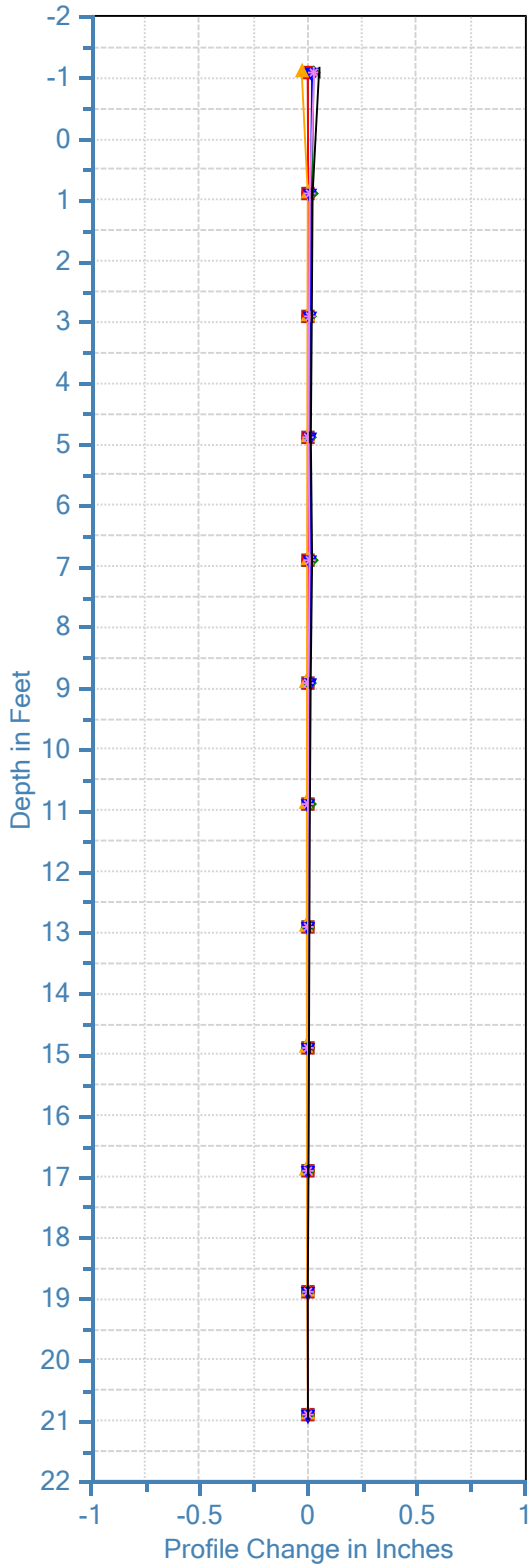
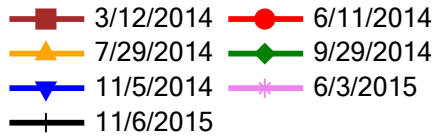


RAINB 2, B-Axis

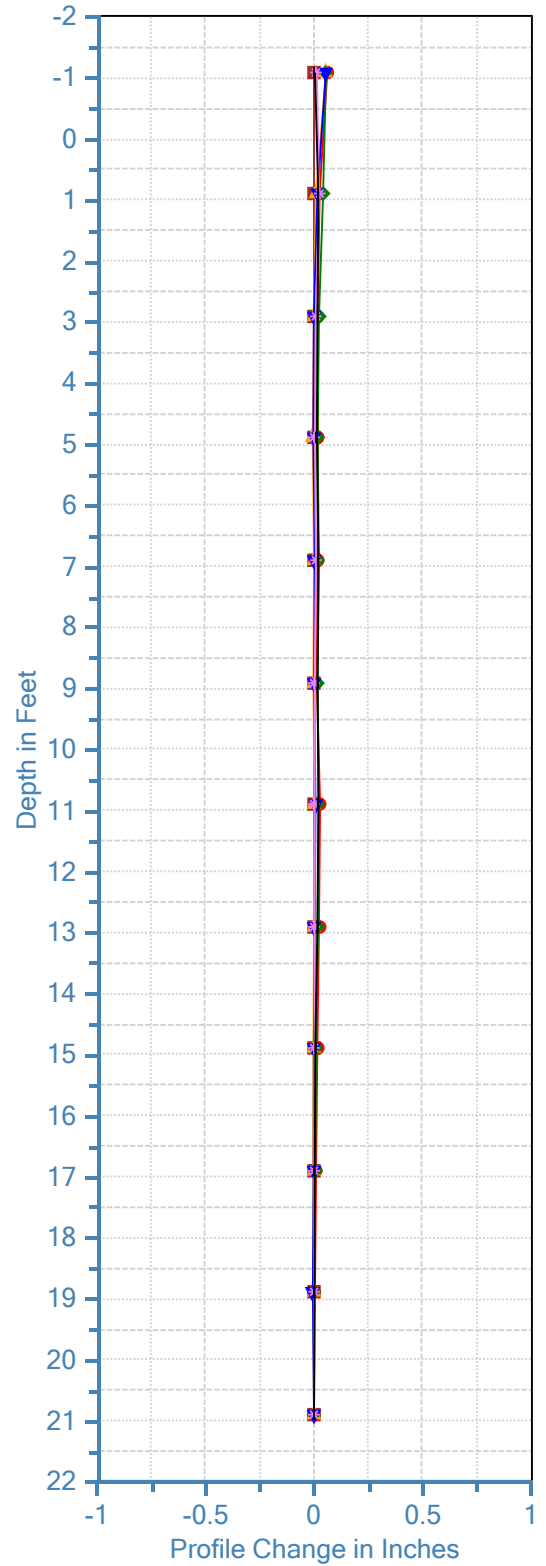
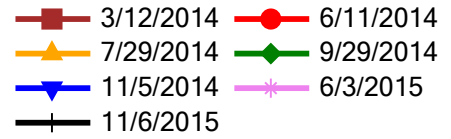




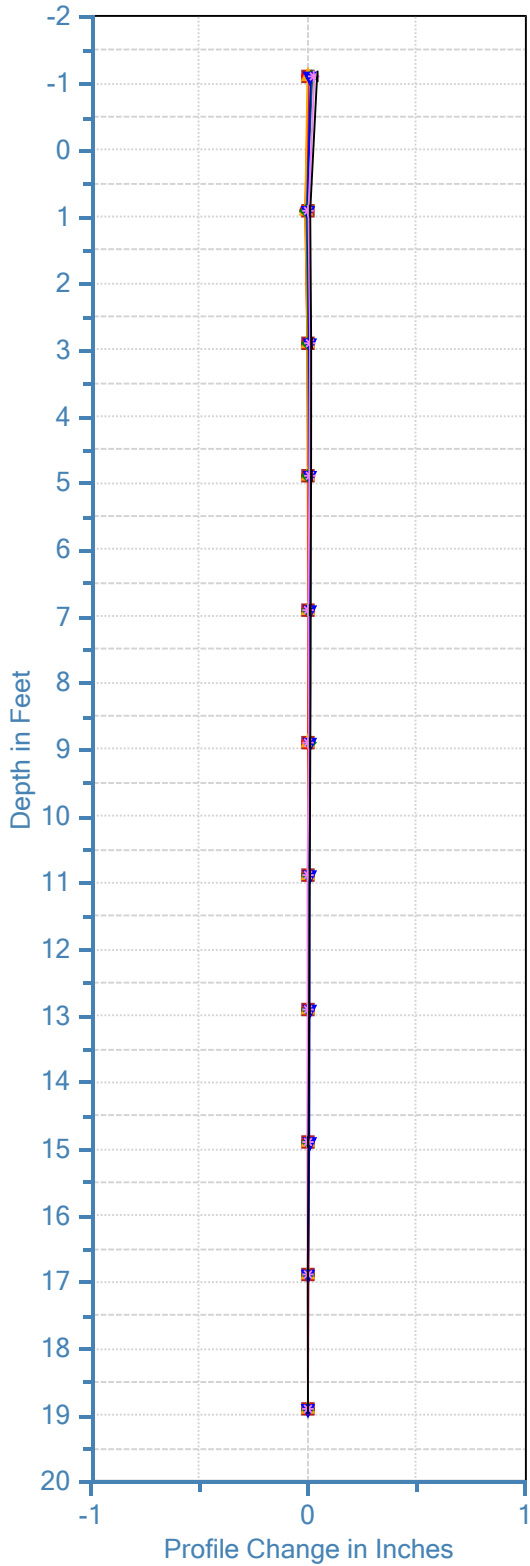
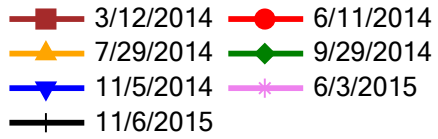
RAINB 3, A-Axis



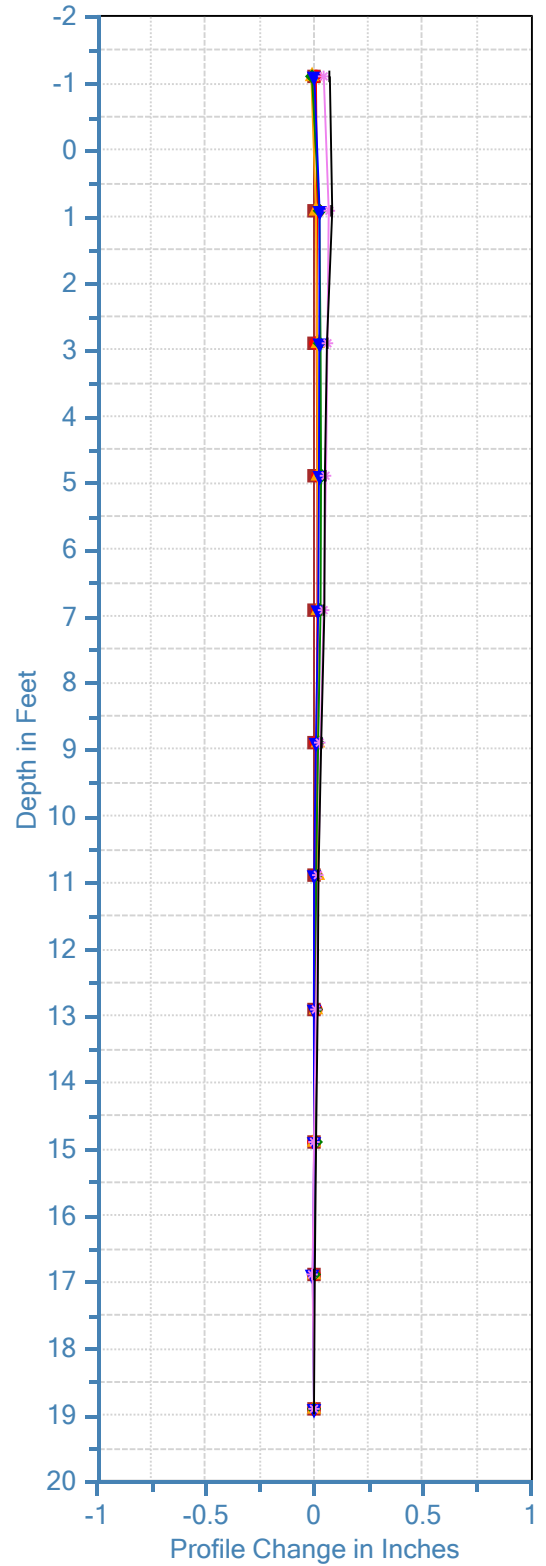
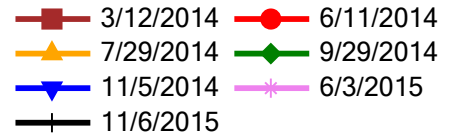
RAINB 3, B-Axis



RAINB B4, A-Axis



RAINB B4, B-Axis



# Rainbow Dam Overlook Investigation

June 17, 2014

Ms. Nancy Johnson  
American Public Land Exchange

Mr. Kelly Williams, P.E.  
Montana Fish, Wildlife & Parks

Mr. Matt Marcinek  
Montana Fish, Wildlife & Parks

**RE: Rainbow Dam Overlook Landslide Study**

Dear Rainbow Dam Overlook Team;

Pioneer Technical Services (Pioneer) has completed a subsurface investigation earlier this March on site at the Rainbow Dam Overlook area. The purpose of the investigation was to evaluate the soil and rock formation materials near a failing slope of the Rainbow Dam Overlook parking area and for what appears to be a stable slope northwest of the parking area.

Four boreholes were drilled by Boland Drilling of Great Falls from March 5 through March 7. The boreholes were logged by Michael Browne or Todd Lorenzen from Pioneer. Continuous standard penetration testing (SPT) was conducted through the soil overburden and into much of the weathered bedrock. Following each of these boreholes, an inclinometer pipe was installed and grouted in-place. Within 10 feet of each of the inclinometer boreholes, a nested piezometer borehole was drilled. The piezometer boreholes were not sampled.

BH-01 and BH-04 were drilled within the Rainbow Dam Overlook's boundary near the slope edge. BH-02 and BH-03 were drilled northwest of the Rainbow Dam Overlook's parking area, also near the slope edge. Figure 1 presents the borehole locations.

**Subsurface Materials**

The overburden soils were sampled continuously with split spoon samplers as part of the SPT operations. The split spoon samplers were of three different outside diameters – 3-inch, 2.5-inch, and 2-inch. The 2-inch diameter is the standard diameter for SPT split spoon samplers. The other two diameters are considered over-sized and their blow counts were corrected to compare them against the standard-size sampler. The blow counts at 6-inch intervals are added together to measure the blows per foot for an SPT. For an 18-inch long or a 24-inch long sampler, the 2<sup>nd</sup> and 3<sup>rd</sup> 6-inch blow count intervals are added together. The blows per foot are regarded as the 'N-value'. The N-value is a measure of the soil's relative density for granular soils or of its relative consistency for cohesive soils. The field blow counts are presented on the Logs of Boring. The corrected N-values for the over-sized samplers and the N-values for the standard-sized sampler are also presented on the Logs of Boring.



Thin-walled shelby tubes were pushed at the 10-foot depth in the medium stiff fat clays within BH-01 and in BH-04. In general, the soils in each of these boreholes classified as fat clay to a depth of approximately 16 feet before grading into weathered mudstone. The mudstone had a very soft to soft field hardness and graded into weathered shale having a medium field hardness.

In BH-02 and BH-03, the formation materials were closer to the ground surface. Mudstone was logged at a depth of 9.5 feet in BH-02 and at a depth of 5 feet in BH-03.

Triaxial strength testing was completed on the thin-walled samples from BH-01 and BH-04. A cohesion value,  $c$ , of 480 pounds per square foot (psf) and an internal angle of friction,  $\phi$ , of 9 degrees were measured. An average unit weight of 97 pounds per cubic foot (pcf) was measured from the three approximately 6-inch long samples used to conduct the triaxial testing.

### **Inclinometer Data**

The inclinometers were installed to measure the horizontal deformations within the vertical direction and evaluate where the movement is occurring. Three readings have been completed. The first reading was taken March 26, 2014 and established a base to compare future readings against. The two subsequent readings were made on May 22 and on June 11.

The May 22 readings indicated some movement was occurring primarily in BH-01, beginning at about the 7-foot depth that translated to about 0.10 inches of movement at the ground surface. Due to that movement, we read the inclinometers two weeks later on June 11. Those measurements were nearly identical to the May 22 readings in each of the boreholes.

### **Piezometer Data**

The nested piezometers were installed to determine at what elevation potential groundwater was collecting and thus weakening the soil slopes. The piezometers were read after completing the inclinometer readings. As of the June 11 readings, only the middle piezometer in P-04 next to BH-04 had a measureable groundwater table level. It was measured on May 22 and on June 11 at 14.88 feet below the ground surface, which is within fat clay. A thin lens of fine-grained sand was noted at the 15.7-foot depth in the inclinometer borehole. The middle piezometer is slotted between the 8- and 17-foot depths. It is probable that water is traveling freely through the sand lens and is under some head pressure. Each of the other three nested piezometers was dry, including P-01 where some movement has been detected in BH-01.

### **Topographical Survey**

Pioneer completed a topographical survey that will be used during the design stage. It is included with this report.

### **Brief Summary**

Thus far, movements are much slower at this Overlook location compared to when the Lewis & Clark Overlook was moving. Regardless, there is still movement. From our experience with the Lewis & Clark Overlook piezometers, the groundwater table was slow to appear in some of the piezometers. We anticipate that there will be a measureable groundwater table in BH-01 before we see it in BH-02 and BH-03. We will continue to monitor the inclinometers and piezometers. Our next reading should take place in late July.

From past experience at both of these Overlooks, we can expect there will be continued slope sloughing at the Rainbow Dam Overlook. In our opinion, it would be prudent to begin planning to unload the present Rainbow Overlook location and either keep it in the same location or perhaps move it toward the northwest and placing only a base course and surfacing section as fill.

If you have any questions regarding this letter report, please contact Todd Lorenzen at 406-490-1523.











Sincerely,  
PIONEER TECHNICAL SERVICES, INC.

A handwritten signature in blue ink that reads "Todd Lorenzen". The signature is written in a cursive, flowing style.



Todd Lorenzen, P.E.  
Sr. Geotechnical Project Manager

## GENERAL NOTES

### DRILLING & SAMPLING SYMBOLS:

SS: 	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	CA: 	Casing Advancer
ST: 	Thin-Walled Tube - 2" O.D., unless otherwise noted	DA: 	Drill Auger
CB: 	California Sampler - 2" I.D., 2.5" O.D., unless otherwise noted	HA: 	Hand Auger
DB: 	Diamond Bit Coring - 4", NX, unless otherwise noted	RB: 	Rock Bit
BS: 	Bulk Sample or Auger Sample	GS: 	Grab Sample

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". The field blow counts are reported for each 6-inch interval, or portion thereof if greater than 50 blows are required to advance the full 6-inch interval. For over-sized split spoon samplers, non-standard hammers, or non-standard drop heights, the field penetration values are reported on the bore log. The values must be corrected to obtain the N-value.

WL:	Water Level	WS:	While Sampling	NE:	Not Encountered
WCI:	Wet Cave-In	WD: 	While Drilling		
DCI:	Dry Cave-In	BCR:	Before Casing Removal		
AB:	After Boring	ACR: 	After Casing Removal		

Groundwater table levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater table levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater table levels may not be possible with only short-term observations.

**DESCRIPTIVE SOIL CLASSIFICATION:** Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: gravel or sand. Cobbles and boulders are not part of the USCS system but are included, when present, as percentages. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; depending on their plasticity, they are described as clay or silt. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils are defined on the basis of their consistency.

### CONSISTENCY OF FINE-GRAINED SOILS

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,001 - 2,000	5 - 8	Medium Stiff
2,001 - 4,000	9 - 15	Stiff
4,001 - 8,000	16 - 30	Very Stiff
8,000 +	30 +	Hard

### RELATIVE DENSITY OF COARSE-GRAINED SOILS

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>California Barrel (CB) Blows/Ft.</u>	<u>Relative Density</u>
0 - 4	0 - 6	Very Loose
5 - 10	7 - 18	Loose
11 - 30	19 - 58	Medium Dense
31 - 50	59 - 98	Dense
50 +	99 +	Very Dense

### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of Other Constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 30
Modifier	> 30

### USCS\* GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

\*For AASHTO grain size the #4 sieve is replaced with the #10 sieve

### RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of Other Constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifiers	> 12

### PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-Plastic	0
Slightly	1 - 5
Low	6 - 10
Medium	11 - 20
Highly	21 - 40
Very Highly	> 40



## GENERAL NOTES

### Description of Rock Properties

#### WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very Slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately Severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Highly	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very Highly	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete/Residual Soil	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

#### FIELD HARDNESS (for engineering description of rock not to be confused with Moh's scale for minerals)

Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

#### Joint, Bedding and Foliation Spacing in Rock <sup>a</sup>

Spacing		Joints	Bedding/Foliation
Less than 2 in.		Very Close	Very Thin
2 in. - 1 ft.		Close	Thin
1 ft. - 3 ft.		Moderately Close	Medium
3 ft.-10 ft.		Wide	Thick
More than 10 ft.		Very Wide	Very thick

Rock Quality Designation (RQD) <sup>b</sup>		Joint Openness Descriptors	
ROD, as a percentage	Diagnostic description	Openness	Descriptor
Exceeding 90	Excellent	No Visible Separation	Tight
90 - 75	Good	Less than 1/32 in.	Slightly Open
74 - 50	Fair	1/32 to 1/8 in.	Moderately Open
49 - 25	Poor	1/8 to 3/8 in.	Open
Less than 25	Very poor	1/2 in. to 1 1/4 in.	Moderately Wide
		Greater than 1 1/4 in.	Wide

a. Spacing refers to the distance normal to the planes of the described feature, which are parallel to each other or nearly so.

b. RQD (given as a percentage) = ( $\Sigma$  of core 4 in. and longer) / (length of run).

References: American Society of Civil Engineers Manuals and Reports on Engineering Practice - No. 56, American Society of Civil Engineers, 1976.  
 U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.  
 AASHTO M145, 2010.





# UNIFIED SOIL CLASSIFICATION SYSTEM

## Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification	
				Group Symbol	Group Name <sup>B</sup>
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $1 \leq Cc \leq 3$	GW	Well-graded Gravel <sup>F</sup>
			$Cu < \text{and/or } 1 > Cc > 3$	GP	Poorly graded gravel <sup>F</sup>
		Gravels with Fines More than 12% fines	Fines classify as ML or MH	GM	Silty Gravel <sup>F,G,H</sup>
			Fines classify as CL or CH	GC	Clayey Gravel <sup>F,G,H</sup>
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1 \leq Cc \leq 3$	SW	Well-graded Sand <sup>I</sup>
			$Cu < 6$ and/or $1 > Cc > 3$	SP	Poorly graded Sand <sup>I</sup>
		Sands with Fines More than 12% fines	Fines classify as ML or MH	SM	Silty Sand <sup>G,H,I</sup>
			Fines classify as CL or CH	SC	Clayey Sand <sup>G,H,I</sup>
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line	CL	Lean Clay <sup>K,L,M</sup>
			$PI < 4$ or plots below "A" line	ML	Silt <sup>K,L,M</sup>
		organic	<u>Liquid limit - oven dried</u> < 0.75	OL	Organic Clay <sup>K,L,M,N</sup>
			Liquid limit - not dried		Organic Silt <sup>K,L,M,Q</sup>
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line	CH	Fat Clay <sup>K,L,M</sup>
			PI plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>
		organic	<u>Liquid limit - oven dried</u> < 0.75	OH	Organic Clay <sup>K,L,M,P</sup>
			Liquid limit - not dried		Organic Silt <sup>K,L,M,Q</sup>
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

<sup>A</sup> Based on the material passing the 3-in. (75-mm) sieve

<sup>B</sup> If field sample contains cobbles and/or boulders, add "with cobbles or boulders, or both" as necessary to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$^E Cu = D_{60} / D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly sand, add "sandy" to group name.

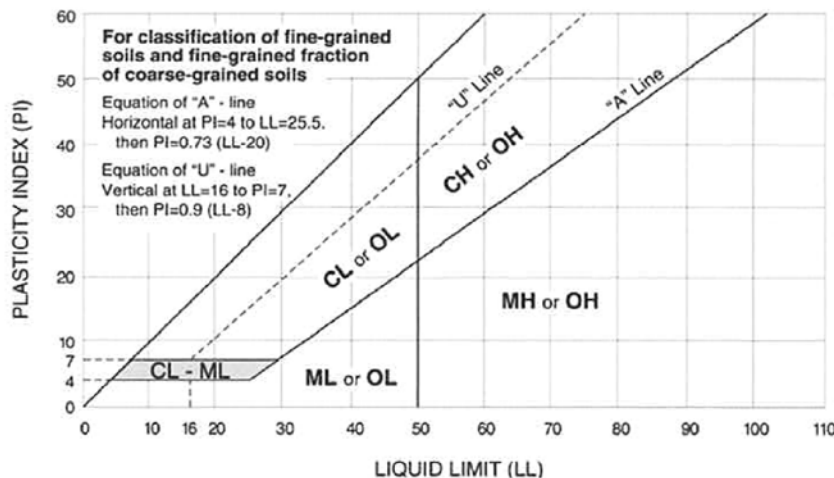
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup> PI < 4 or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

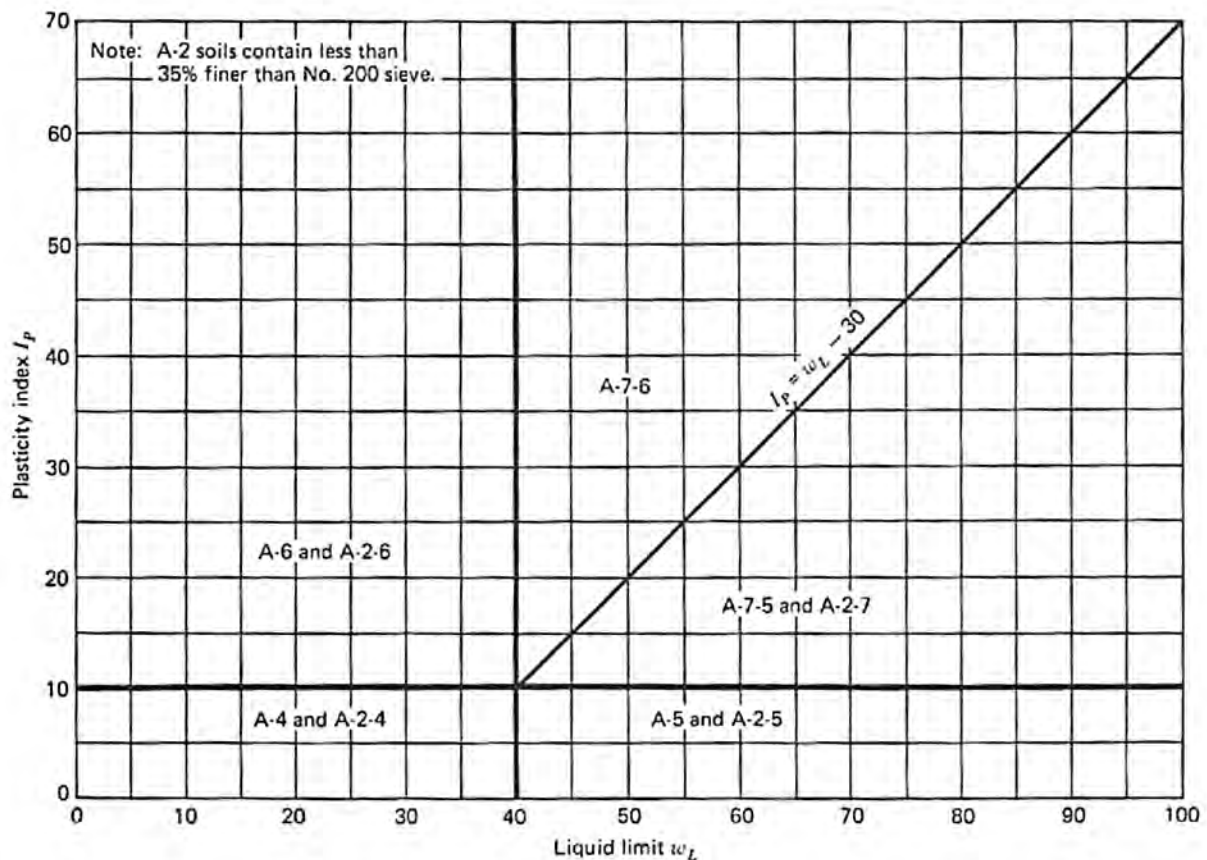
<sup>Q</sup> PI plots below "A" line.



## AASHTO SOIL CLASSIFICATION SYSTEM

General classification	Granular materials (35 percent or less of total sample passing No. 200)							Silt-clay material (More than 35 percent of total sample passing No. 200)			
Group classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7 <sup>1</sup>
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve analysis percent passing No. 10 No. 20 No. 200	50 max 30 max 15 max	50 max 25 max	51 max 10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing No. 40 Liquid limit, $w_L$ Plastic limit, $I_p$	6 max		NP	40 max 10 max	41 min 10 max	40 max 11 min	41 min 11 min	40 max 10 max	41 min 10 max	40 max 11 min	41 min 11 min
Significant constituent materials	gravel and sand		fine sand	silty and clayey gravel and sand				silty soils		clayey soils	

<sup>1</sup> Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.



# LOG OF BORING



Project Name: Rainbow Dam Overlook						Project Number:																	
Borehole Location: See Figure 1						Borehole Number: BH-01			Sheet <u>1</u> of <u>2</u>														
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Browne														
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/6/2014			Date Finished: 3/6/2014														
Elevation and Datum: Ground: 3335.15 Casing:						Notes: Borehole completed with two hand slotted piezometers. P-01a slotted between 17.0 & 19.5 ft depth. P-01b slotted between 8.0 and 16.0 ft depth. PP=Pocket Penetrometer																	
DEPTH (feet)	DRILL		CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS								
	OPERATION	PRESSURE (psi)														RATE (fph)	SPT	LL	PL				
0			400			65	10/12/12/8 Ncorr = 15	6					FILL, Poorly Graded Gravel with Silt and Sand (GP); subangular; frozen to moist; brown (7.5YR 4/4); mild reaction to HCl.	1.5									
2						60	2/3/2 Ncorr = 4	17		56	16		Fat CLAY with Sand (CH), trace Organics; moist; yellowish brown (10YR 5/4); soft; mild HCl reaction; high plasticity.  PP <sub>ave</sub> =2.25										
4						45	1/1/3 N = 4	21					Fat CLAY (CH), trace Gravel, occasional Sand seams; moist; olive brown (2.5Y 4/4) to olive gray (5Y 4/2); medium stiff to stiff; weak HCl reaction; high plasticity. PP <sub>ave</sub> =1.75	4.0									
6			190			80	2/4/6/6 Ncorr = 6	21					Gray mottling between 5 and 7 ft depth. Occasional Coal inclusions between 5 and 14.9 ft depth. PP <sub>ave</sub> =1.25										
8						45	3/4/7 Ncorr = 7	24					PP <sub>ave</sub> =1.0										
10						10	3/3/4 N = 7	12															
12			190			70		102							c = 480 psf; phi = 9 degrees								
14						100	3/5/8 Ncorr = 9	28					PP <sub>ave</sub> =2.6										
						95	3/4/8 N = 12	27					PP <sub>ave</sub> =2.8	14.9									
Operation Types:  Auger  Casing Advancer  Core Barrel  Drive Casing												Sampler Types:  Split Spoon  Shelby  Bulk Sample  Grab Sample  Penetrometer  Vane Shear  Special Samplers  Testpit											
												WATER LEVEL OBSERVATIONS While Drilling <u>  </u> ft Upon Completion of Drilling <u>  </u> ft Time After Drilling <u>  </u> Depth To Water (feet) <u>  </u> Remarks: Groundwater table not encountered during drilling.											

# LOG OF BORING



Project Name: Rainbow Dam Overlook						Project Number:										
Borehole Location: See Figure 1						Borehole Number: BH-01			Sheet <u>2</u> of <u>2</u>							
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Browne							
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/6/2014			Date Finished: 3/6/2014							
Elevation and Datum: Ground: 3335.15 Casing:						Notes: Borehole completed with two hand slotted piezometers. P-01a slotted between 17.0 & 19.5 ft depth. P-01b slotted between 8.0 and 16.0 ft depth. PP=Pocket Penetrometer										
DEPTH (feet)	DRILL		CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS	
	OPERATION	PRESSURE (psi)														RATE (fph)
16			200			90	3/8/9/18 Ncorr = 11		19					16.6	<p>Fat CLAY with Sand (CH); moist; olive brown (2.5Y 4/4) to reddish brown (2.5YR 4/4); stiff; weak HCl reaction; high plasticity. PP<sub>ave</sub>=1.8</p> <p>MUDSTONE; highly to moderately weathered; very soft field hardness; moist; gray (2.5Y 5/1) to very dusky red (10R 2.5/2), trace iron staining; no to weak HCl reaction.</p> <p>SHALE BEDROCK; moderately weathered; medium field hardness; damp; reddish brown; no reaction to HCl.</p> <p>Three different sized split spoon samplers were used during the SPT testing: 3" O.D., 2.5" O.D, and standard 2" O.D. The N-value has been corrected for the oversize samplers (Ncorr =) or stated as N =, for the standard sized sampler.</p>	
18						90	9/12/15 Ncorr = 18									
20						55	7/11/16 N = 27									
						80	50R/5"									
						10	Ncorr = 31 25 No Pen.							20.4		
														20.5	BOH Elev. = 3314.7	

<b>Operation Types:</b> Auger Casing Advancer Core Barrel Drive Casing	<b>Sampler Types:</b> Split Spoon Shelby Bulk Sample Grab Sample	Penetrometer Vane Shear Special Samplers Testpit	<b>WATER LEVEL OBSERVATIONS</b> While Drilling <u>  </u> ft    Upon Completion of Drilling <u>  </u> ft Time After Drilling <u>  </u> Depth To Water (feet) <u>  </u> Remarks: Groundwater table not encountered during drilling.
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Project Name: Rainbow Dam Overlook										Project Number:																																																																																																																																																																											
Borehole Location: See Figure 1										Borehole Number: BH-02										Sheet 1 of 2																																																																																																																																																																	
Drilling Equipment: CME 55										Hammer: Type: Safety										Driller: Boland										Logger: Lorenzen																																																																																																																																																							
Drilling Fluid: NA										Borehole Diameter (in): 6										Date Started: 3/07/2014										Date Finished: 3/07/14																																																																																																																																																							
Elevation and Datum: Ground: 3324.81										Casing:										Notes: Borehole completed with two hand slotted piezometers. P-02a slotted between 10.0 & 15.0 ft depth. P-02b slotted between 5.0 and 9.0 ft depth.																																																																																																																																																																	
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# LOG OF BORING



Project Name: Rainbow Dam Overlook							Project Number:										
Borehole Location: See Figure 1							Borehole Number: BH-02			Sheet 2 of 2							
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Lorenzen								
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/07/2014			Date Finished: 3/07/14								
Elevation and Datum: Ground: 3324.81      Casing:							Notes: Borehole completed with two hand slotted piezometers. P-02a slotted between 10.0 & 15.0 ft depth. P-02b slotted between 5.0 and 9.0 ft depth.										
DEPTH (feet)	DRILL			CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST SPT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT		PLASTIC LIMIT	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS
	OPERATION	PRESSURE (psi)	RATE (fph)								LL	PL					
16			55					25 No Pen.							MUDSTONE continued		BINCL Elev.= 3308.3
18																	
20																	
Three different sized split spoon samplers were used during the SPT testing: 3" O.D., 2.5" O.D, and standard 2" O.D. The N-value has been corrected for the oversize samplers (Ncorr =) or stated as N =, for the standard sized sampler.																BPiezo Elev. = 3304.8	



Project Name: Rainbow Dam Overlook										Project Number:																																																																																																																																																																													
Borehole Location: See Figure 1										Borehole Number: BH-03										Sheet 1 of 2																																																																																																																																																																			
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Elevation and Datum: Ground: 3316.24										Casing:										Notes: Borehole completed with two hand slotted piezometers. P-03a slotted between 10.0 & 20.0 ft depth. P-03b slotted between 4.0 and 9.0 ft depth.																																																																																																																																																																			
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Minus No. 40 sieve materials are highly plastic.	0.5	Lean CLAY (CL); moist to damp; light yellowish brown (10YR 6/4) to dusky red (10R 3/1); hard; strong reaction to 10% HCl solution; medium plastic.	5.0	MUDSTONE; highly to moderately weathered; very soft field hardness; damp; very dusky red (10R 2.5/2) to reddish brown (2.5YR 5/3); no to weak reaction to 10% HCl solution.	11.0		MUDSTONE; moderately weathered; soft field hardness; damp; grey (10YR 6/1); no reaction to 10% HCl solution.		
DEPTH (feet)	OPERATION	PRESSURE (psi)	RATE (fph)	CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)									MOISTURE CONTENT (%)			LIQUID LIMIT	PLASTIC LIMIT		GRAPHIC LOG																																																																																																																																																															
								SPT		LL	PL																																																																																																																																																																												
2	[Symbol]		270			[Symbol]	100	38/13/20 Ncorr = 21		19	48	16	[Symbol]																																																																																																																																																																										
							100	8/10/12 Ncorr = 15			21																																																																																																																																																																												
							100	7/9/12/13 N = 21			8	26		15																																																																																																																																																																									
4	[Symbol]				[Symbol]	100	23/50R (5.5")		10	30	16	[Symbol]																																																																																																																																																																											
						55	22/50R (5.5") N = 100			7																																																																																																																																																																													
6	[Symbol]				[Symbol]	90	30/31/50R (4.5") N = 81		6			[Symbol]																																																																																																																																																																											
										8																																																																																																																																																																													
8	[Symbol]				[Symbol]							[Symbol]																																																																																																																																																																											
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12	[Symbol]				[Symbol]							[Symbol]																																																																																																																																																																											
14	[Symbol]				[Symbol]							[Symbol]																																																																																																																																																																											
MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS																																																																																																																																																																																					
TOPSOIL, Silty Clay (CL-ML) with Organics; frozen; dark grey (10YR 4/1); strong reaction to 10% HCl solution.	0.3	Mudstone Elev. = 3311																																																																																																																																																																																					
FILL, Clayey GRAVEL with Sand (GC), some Slag; frozen to moist; brownish yellow matrix (10YR 6/6); strong reaction to 10% HCl solution. Minus No. 40 sieve materials are highly plastic.	0.5																																																																																																																																																																																						
Lean CLAY (CL); moist to damp; light yellowish brown (10YR 6/4) to dusky red (10R 3/1); hard; strong reaction to 10% HCl solution; medium plastic.	5.0																																																																																																																																																																																						
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# LOG OF BORING



Project Name: Rainbow Dam Overlook						Project Number:																																																																																
Borehole Location: See Figure 1						Borehole Number: BH-03			Sheet <u>2</u> of <u>2</u>																																																																													
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Lorenzen																																																																													
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/07/2014			Date Finished: 3/07/14																																																																													
Elevation and Datum: Ground: 3316.24 Casing:						Notes: Borehole completed with two hand slotted piezometers. P-03a slotted between 10.0 & 20.0 ft depth. P-03b slotted between 4.0 and 9.0 ft depth.																																																																																
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">DEPTH (feet)</th> <th colspan="2">DRILL</th> <th rowspan="2">CORE PERCENT RECOVERY</th> <th rowspan="2">ROCK QUALITY DESIGNATION (RQD)</th> <th rowspan="2">SAMPLE</th> <th rowspan="2">RECOVERY (%)</th> <th rowspan="2">STANDARD PENETRATION TEST</th> <th rowspan="2">DRY DENSITY (pcf)</th> <th rowspan="2">MOISTURE CONTENT (%)</th> <th rowspan="2">LIQUID LIMIT</th> <th rowspan="2">PLASTIC LIMIT</th> <th rowspan="2">GRAPHIC LOG</th> </tr> <tr> <th>OPERATION</th> <th>PRESSURE (psi)</th> <th>RATE (fph)</th> </tr> </thead> <tbody> <tr> <td>16</td> <td></td> <td></td> <td>120</td> <td></td> <td></td> <td>95</td> <td>14/18/39 N = 57</td> <td>12</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>11</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td></td> <td>600</td> <td>70</td> <td></td> <td></td> <td></td> <td>25 No Pen.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>22</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>24</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>												DEPTH (feet)	DRILL		CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	GRAPHIC LOG	OPERATION	PRESSURE (psi)	RATE (fph)	16			120			95	14/18/39 N = 57	12					18								11					20		600	70				25 No Pen.						22													24						
DEPTH (feet)	DRILL		CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT		GRAPHIC LOG																																																																									
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						MATERIAL DESCRIPTION			DEPTH (feet)		REMARKS																																																																											
						MUDSTONE continued			16.0		Shale Elev. = 3300																																																																											
						SHALES; moderately weathered; medium field hardness; damp; grey (10YR 6/1); no reaction to 10% HCl solution.			24.5																																																																													
						Three different sized split spoon samplers were used during the SPT testing: 3" O.D., 2.5" O.D, and standard 2" O.D. The N-value has been corrected for the oversize samplers (Ncorr =) or stated as N =, for the standard sized sampler.																																																																																
						BOH = 3291.7																																																																																

<b>Operation Types:</b> Auger Casing Advancer Core Barrel Drive Casing		<b>Sampler Types:</b> Split Spoon Shelby Bulk Sample Grab Sample		Penetrometer Vane Shear Special Samplers Testpit		<b>WATER LEVEL OBSERVATIONS</b> While Drilling <u>  </u> ft    Upon Completion of Drilling <u>  </u> ft Time After Drilling <u>  </u> <u>  </u> <u>  </u> Depth To Water (feet) <u>  </u> <u>  </u> <u>  </u> <u>  </u> Remarks: <u>  </u>			
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# LOG OF BORING



Project Name: Rainbow Dam Overlook						Project Number:					
Borehole Location: See Figure 1						Borehole Number: BH-04			Sheet <u>1</u> of <u>2</u>		
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Browne		
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/5/2014			Date Finished: 3/5/2014		
Elevation and Datum: Ground: 3339.23 Casing:						Notes: Borehole completed with three hand slotted piezometers. P-04a slotted between 18.0 & 24.0 ft depth. P-04b slotted between 8.0 and 17.0 ft depth. P-04c slotted between 1.0 and 6.0 ft depth. PP=Pocket Penetrometer					

DEPTH (feet)	DRILL			CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS
	OPERATION	PRESSURE (psi)	RATE (fph)													
0.3			400				80	3/4/7/4 Ncorr = 7	6					TOPSOIL, Silty Sand (SM) with Organics, fine grained; moist; dark brown.	0.3	
2.5							90	4/10/5 Ncorr = 10	6					FILL, Poorly Graded Gravel with Silt and Sand (GP); subrounded; frozen to moist; brown (7.5YR 4/4); loose; strong HCl reaction.	2.5	
2.8									18					Reclaimed ASPHALT Pavement, Poorly Graded Gravel with Sand; angular to subangular; damp; redish black (2.5YR 2.5/1).	2.8	
4.5							0	3/2/3 N = 5						Lean CLAY with Sand (CL); damp; olive brown (10Y 4/4); medium stiff; strong HCl reaction; medium plastic.	4.5	
6			400				55	2/5/7/7 Ncorr = 8	23	58	19			Fat CLAY (CH), occasional Sand seams; moist; yellowish brown (10YR 5/6) to olive brown (2.5YR 4/4); medium stiff to stiff; weak HCl reaction; high plasticity.		
8							100	2/3/5 Ncorr = 5	33					PP <sub>ave</sub> =1.9		
10							95	2/2/4 N = 6	31					Coal inclusion noted at 7 ft depth. PP <sub>ave</sub> =1.75		
12			260				75							PP <sub>ave</sub> =1.25		
14							100	2/5/7 Ncorr = 8	28					PP <sub>ave</sub> =2.5		
							100	3/6/7 N = 13	28					PP <sub>ave</sub> =2.9		

Operation Types:

- Auger
- Casing Advancer
- Core Barrel
- Drive Casing

Sampler Types:

- Split Spoon
- Shelby
- Bulk Sample
- Grab Sample
- Penetrometer
- Vane Shear
- Special Samplers
- Testpit

**WATER LEVEL OBSERVATIONS**

While Drilling    ft Upon Completion of Drilling    ft

Time After Drilling 78 days 98 days

Depth To Water (feet) 14.88 14.88

Remarks: Groundwater table not encountered during drilling.



# LOG OF BORING



Project Name: Rainbow Dam Overlook						Project Number:					
Borehole Location: See Figure 1						Borehole Number: BH-04			Sheet <u>2</u> of <u>2</u>		
Drilling Equipment: CME 55				Hammer: Type: Safety		Driller: Boland			Logger: Browne		
Drilling Fluid: NA				Borehole Diameter (in): 6		Date Started: 3/5/2014			Date Finished: 3/5/2014		
Elevation and Datum: Ground: 3339.23 Casing:						Notes: Borehole completed with three hand slotted piezometers. P-04a slotted between 18.0 & 24.0 ft depth. P-04b slotted between 8.0 and 17.0 ft depth. P-04c slotted between 1.0 and 6.0 ft depth. PP=Pocket Penetrometer					

DEPTH (feet)	DRILL		CORE PERCENT RECOVERY	ROCK QUALITY DESIGNATION (RQD)	SAMPLE	RECOVERY (%)	STANDARD PENETRATION TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (feet)	REMARKS
	OPERATION	PRESSURE (psi)													
16			110			95	4/9/12 Ncorr = 13	24					Fat Clay (CH) - continued PP <sub>ave</sub> = 2.9	15.7	Mudstone Elev. = 3323
16						100	5/14/15 Ncorr = 20	8					Poorly Graded SAND (SP), fine-grained; damp; dark yellowish brown (10YR 3/4); no HCl reaction.	15.8	
18						70	7/28/16/12 N = 44	12					MUDSTONE; highly weathered; very soft field hardness; moist; dusky red (10R 3/2); weak HCl reaction.	18.2	
20			60			80	9/20/23/25 Ncorr = 27	14					MUDSTONE; highly weathered; soft field hardness; damp to dry; olive yellow (2.5Y 6/8) to very dark grayish brown (10YR 3/2); weak to no HCl reaction.		
22						85	10/24/50 Ncorr = 50	14						22.8	
24						65	24/50R (3") N = 100	8					SHALE BEDROCK; moderately weathered; medium field hardness; damp; dusky red (2.5YR) to reddish black (2.5YR 2.5/1); no reaction to HCl.	25.0	
25 No Pen.														Three different sized split spoon samplers were used during the SPT testing: 3" O.D., 2.5" O.D, and standard 2" O.D. The N-value has been corrected for the oversize samplers (Ncorr =) or stated as N =, for the standard sized sampler.	BOH Elev. = 3314.2

<b>Operation Types:</b> Auger Casing Advancer Core Barrel Drive Casing	<b>Sampler Types:</b> Split Spoon Shelby Bulk Sample Grab Sample	Penetrometer Vane Shear Special Samplers Testpit	<b>WATER LEVEL OBSERVATIONS</b> While Drilling <u>  </u> ft Upon Completion of Drilling <u>  </u> ft Time After Drilling <u>  78 days  </u> <u>  98 days  </u> Depth To Water (feet) <u>  14.88  </u> <u>  14.88  </u> Remarks: Groundwater table not encountered during drilling.
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DESCRIPTION: Rainbow Overlook Sample #15153 (BH-04 11.4-12.0')  
Point 1 at 20.8 confining pressure



DESCRIPTION: Rainbow Overlook Project, Sample #15153 (BH-04 10.8-11.4')  
Point 2 at 5.2 confining pressure



DESCRIPTION: Rainbow Over look Sample #15146 (BH-01 11.4-12.0')  
Point 3 at 10.4 confining pressure \* Sample has a 3/4" angular gravel at shear plane



DESCRIPTION:  
Rainbow Over look Sample #15146 (11.4-12.0')  
Point 3 at 10.4 confining pressure \* Sample has a 3/4" angular gravel at shear plane



106 Pronghorn Trail, Suite A  
Bozeman, MT 59718



**DESCRIPTION:**

Rainbow Overlook Project, Point 3 Sample #15146 (11.4-12.0')

Point 3 at 10.4 confining pressure \* Sample has a  $\frac{3}{4}$ " angular gravel at shear plane



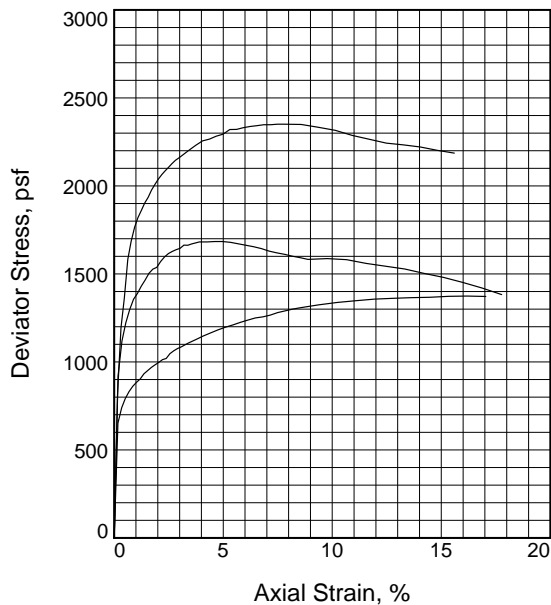
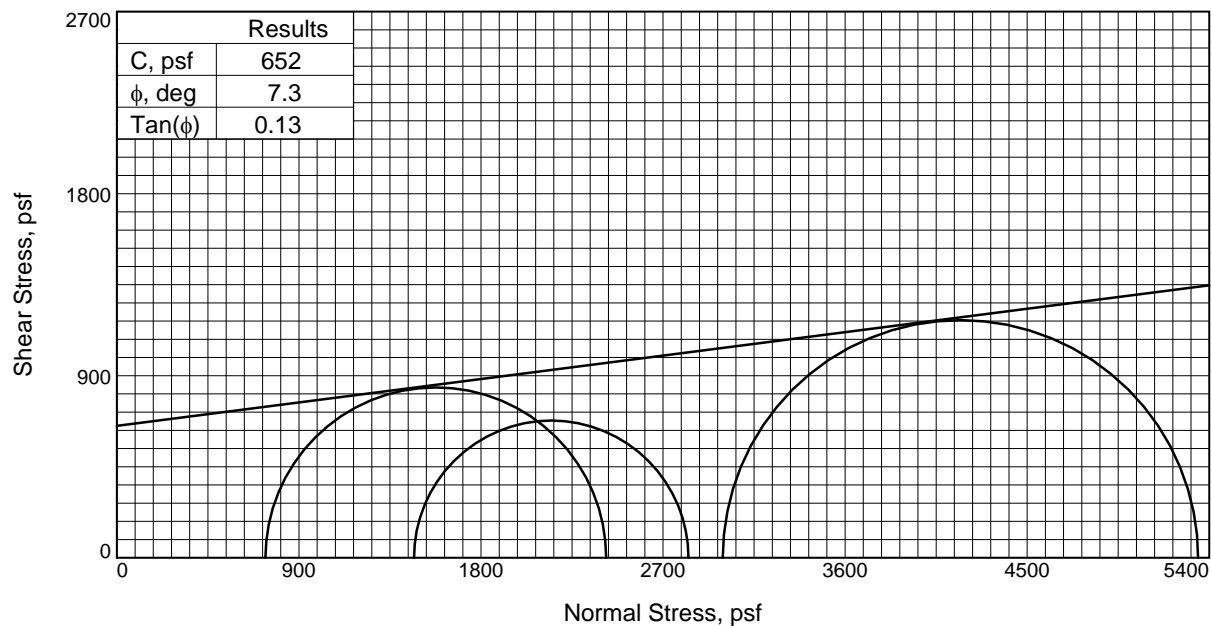
**DESCRIPTION:**

Rainbow Overlook Project, Point 3 Sample #15146 (11.4-12.0')

Point 3 at 10.4 confining pressure \* Sample has a  $\frac{3}{4}$ " angular gravel at shear plane



106 Pronghorn Trail, Suite A  
Bozeman, MT 59718



Sample No.		1	2	3
Initial	Water Content, %	29.0	29.3	31.3
	Dry Density, pcf	96.3	94.3	101.8
	Saturation, %	103.3	99.7	127.4
	Void Ratio	0.7639	0.7998	0.6681
	Diameter, in.	2.85	2.85	2.88
	Height, in.	6.41	5.87	5.63
At Test	Water Content, %	31.1	32.8	33.4
	Dry Density, pcf	96.3	94.3	101.8
	Saturation, %	110.7	111.7	135.8
	Void Ratio	0.7639	0.7998	0.6681
	Diameter, in.	2.85	2.85	2.88
	Height, in.	6.41	5.87	5.63
Strain rate, in./min.		0.06	0.06	0.06
Back Pressure, psi		57.10	71.00	96.40
Cell Pressure, psi		77.90	81.20	101.50
Fail. Stress, psf		2350	1357	1684
Strain, %		8.6	11.9	5.0
Ult. Stress, psf		2203	1373	1480
Strain, %		14.8	15.3	15.1
$\sigma_1$ Failure, psf		5345	2826	2419
$\sigma_3$ Failure, psf		2995	1469	734

#### Type of Test:

Unconsolidated Undrained

#### Sample Type:

Description: fat clay

LL= 69

PL= 18

PI= 51

Specific Gravity= 2.72

Remarks:

Figure \_\_\_\_\_

#### Client:

Project: Rainbow Outlook

Source of Sample: BH-01&BH-04

Depth: 10-12'

Sample Number: 15146/15153

Proj. No.:

Date Sampled:

TRIAXIAL SHEAR TEST REPORT

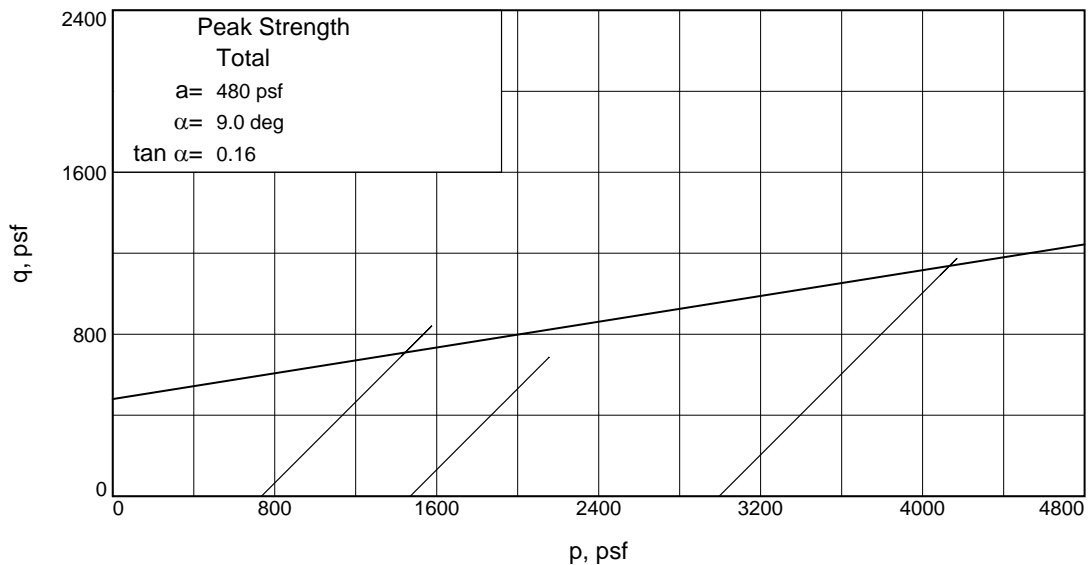
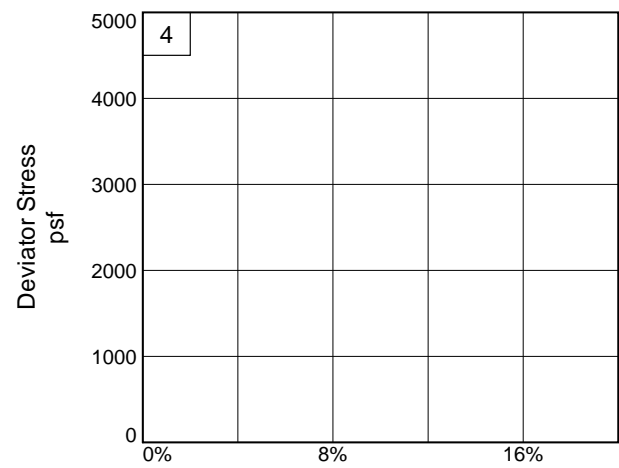
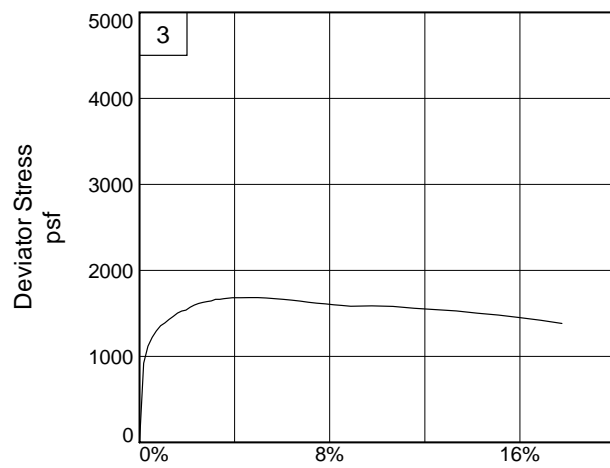
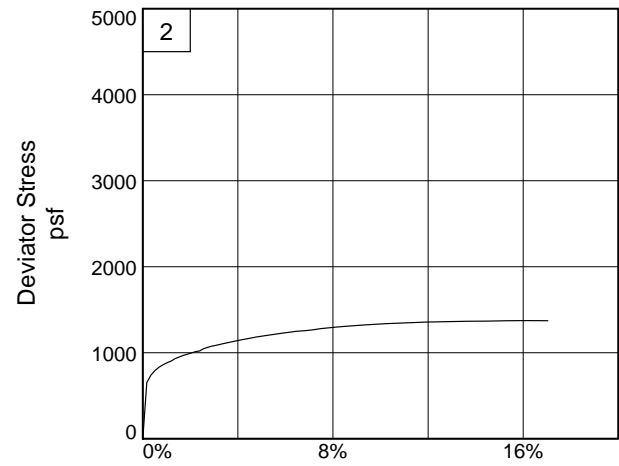
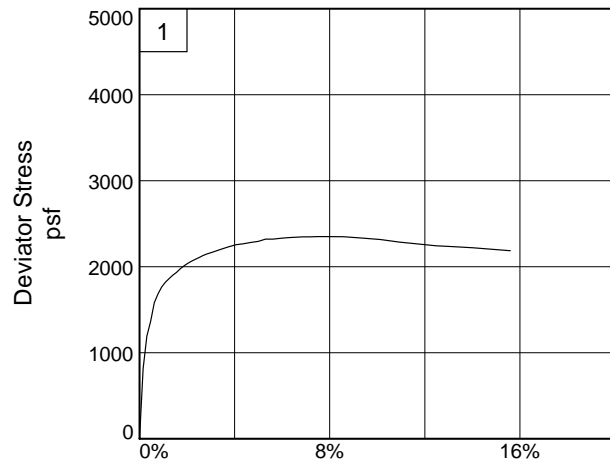
Pioneer Technical Services, Inc.

106 Pronghorn Trail, Suite A - Bozeman, MT 59718

Tested By: NG/LS

Checked By: JR





**Client:**

**Project:** Rainbow Outlook

**Source of Sample:** BH-01&BH-04

**Depth:** 10-12'

**Sample Number:** 15146/15153

**Project No.:**

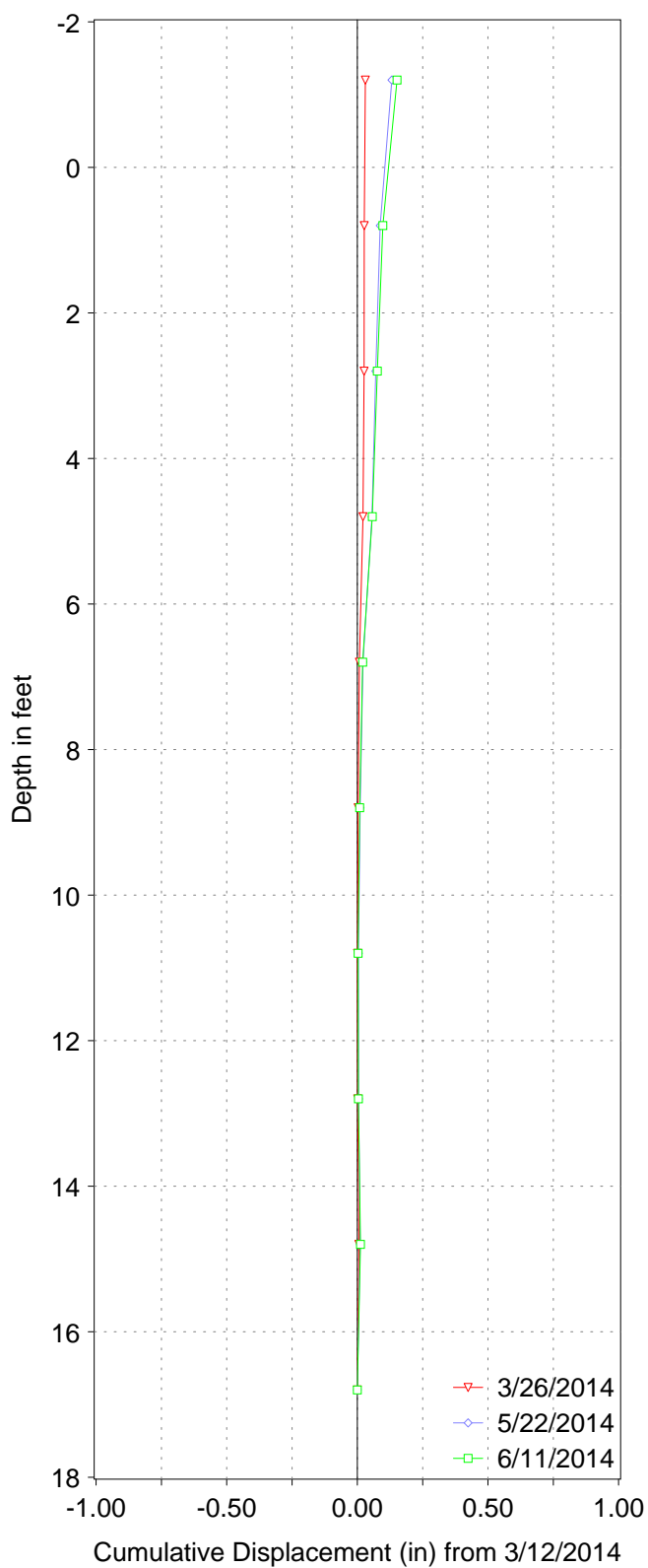
**Figure** \_\_\_\_\_

**Pioneer Technical Services, Inc.**

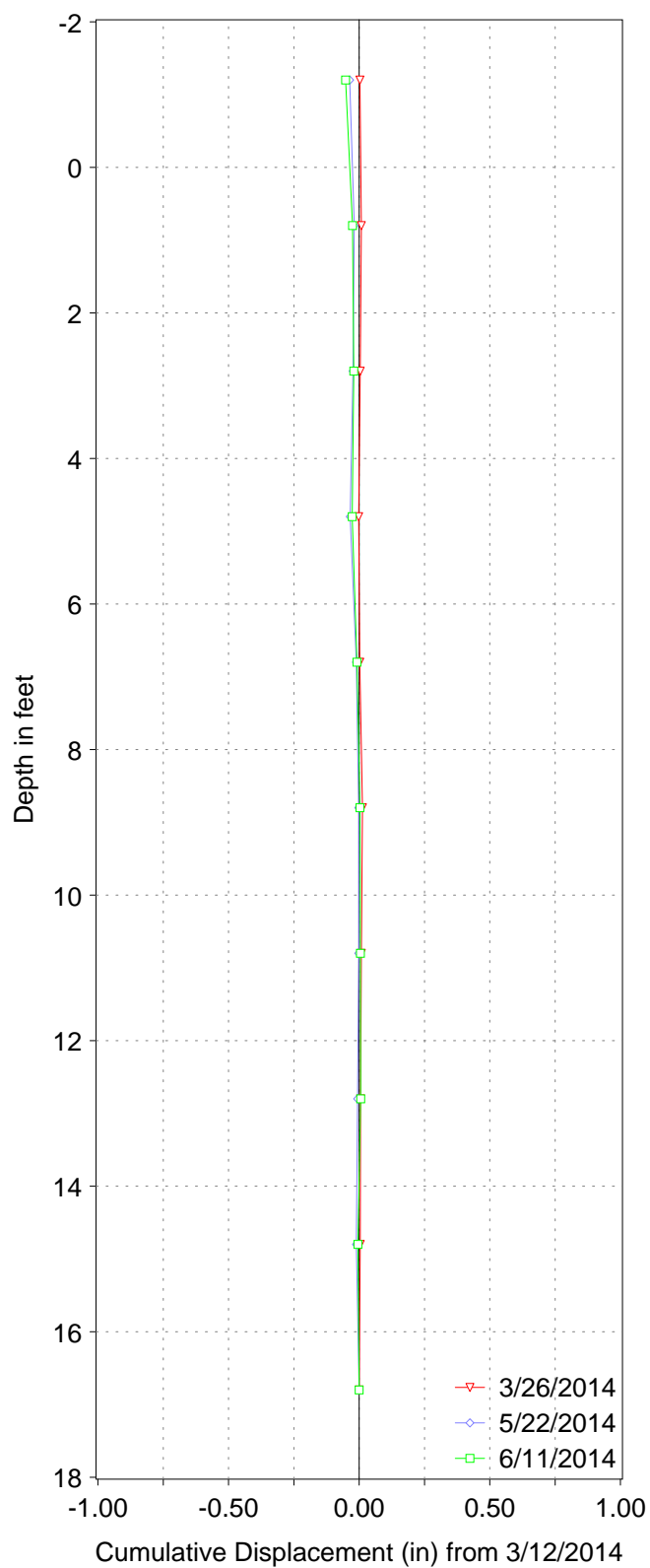
**Tested By:** NG/LS

**Checked By:** JR

# RAINB B1, A-Axis

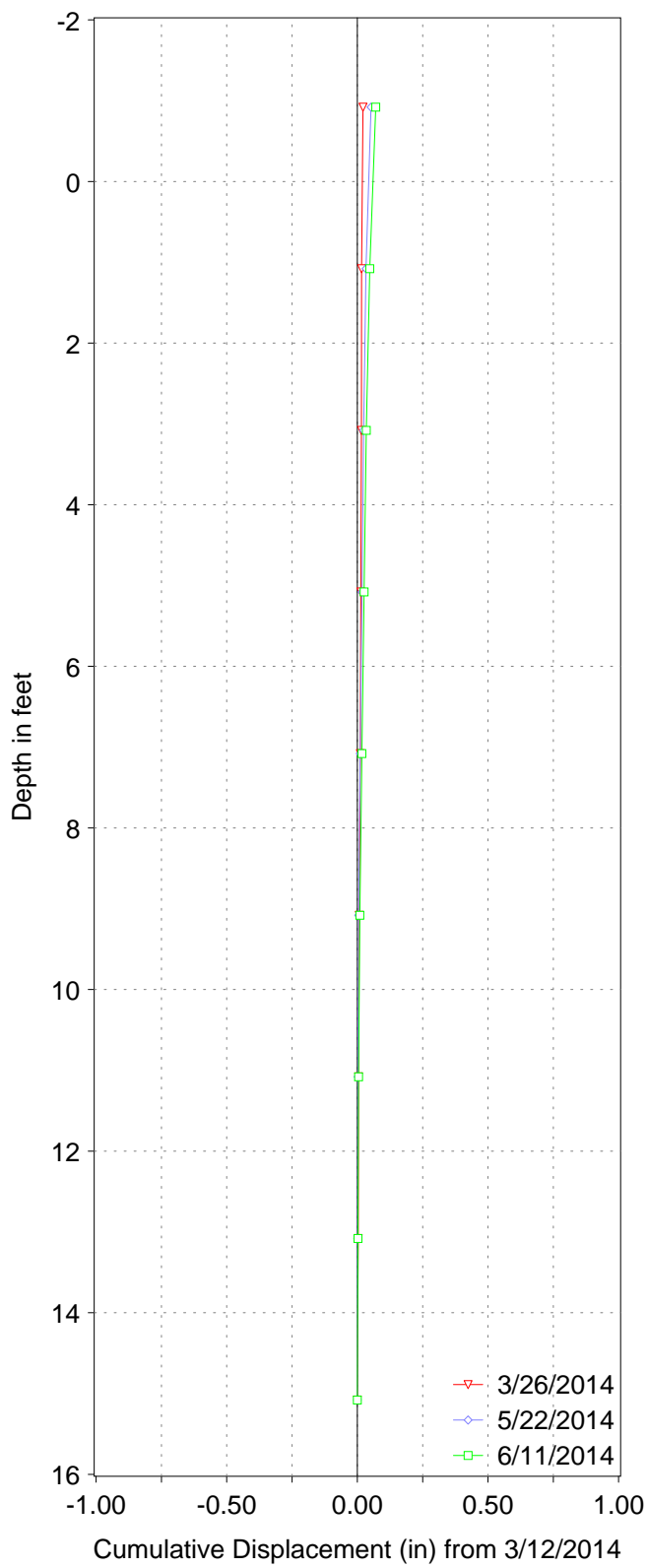


# RAINB B1, B-Axis

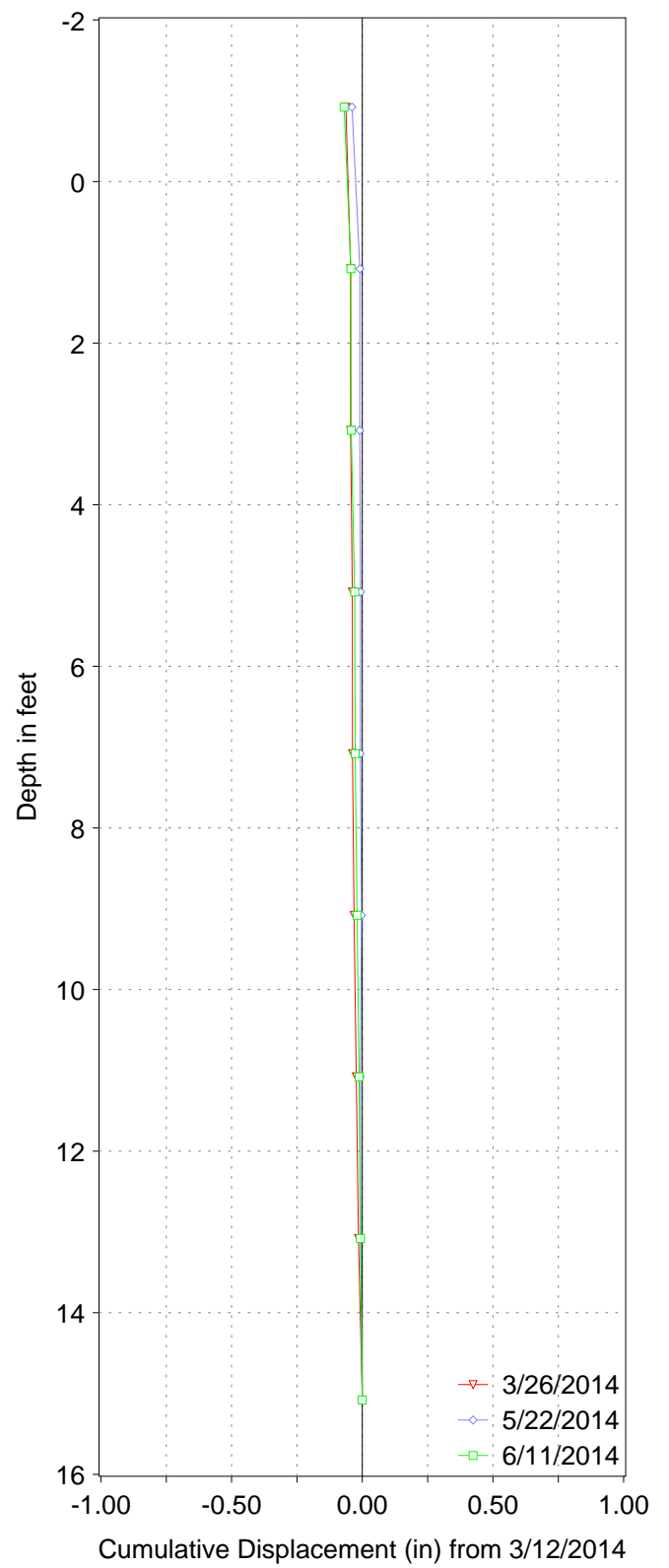


Rainbow Overlook  
BH-01

RAINB 2, A-Axis

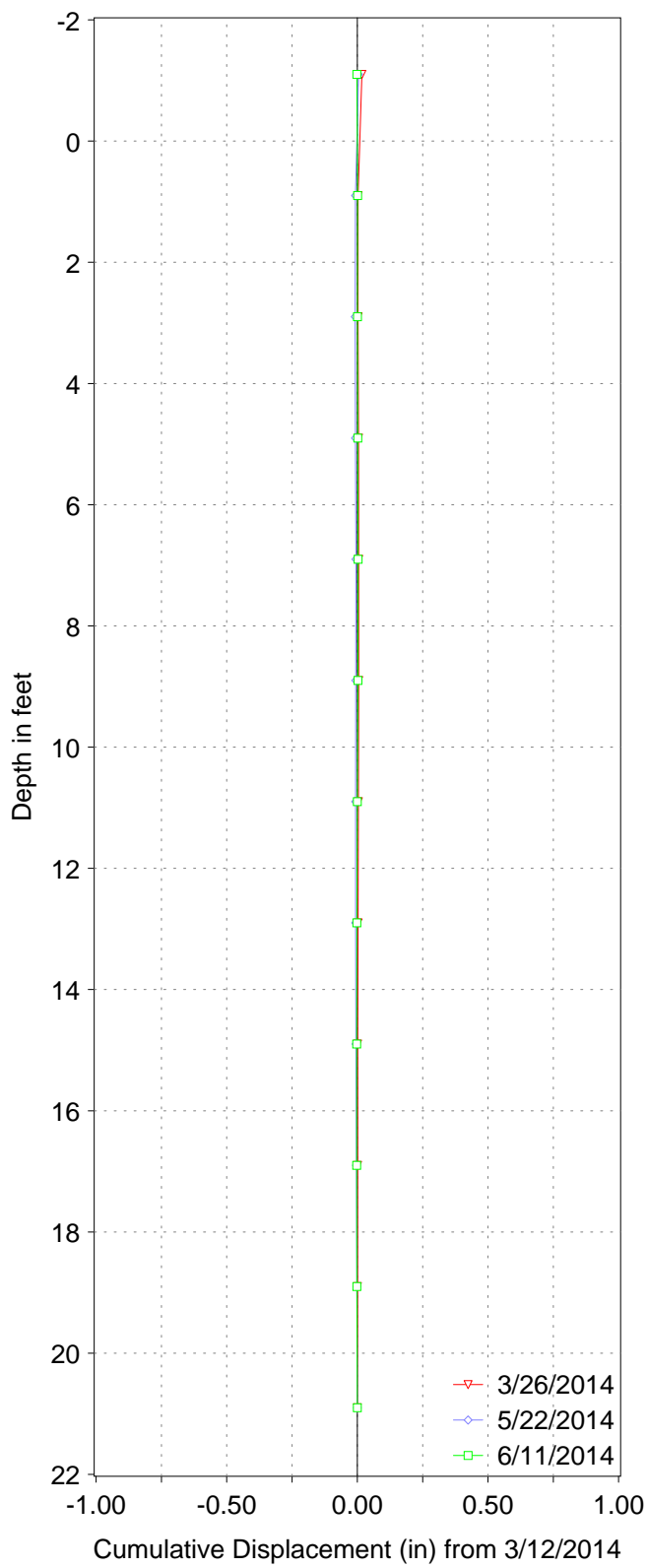


RAINB 2, B-Axis

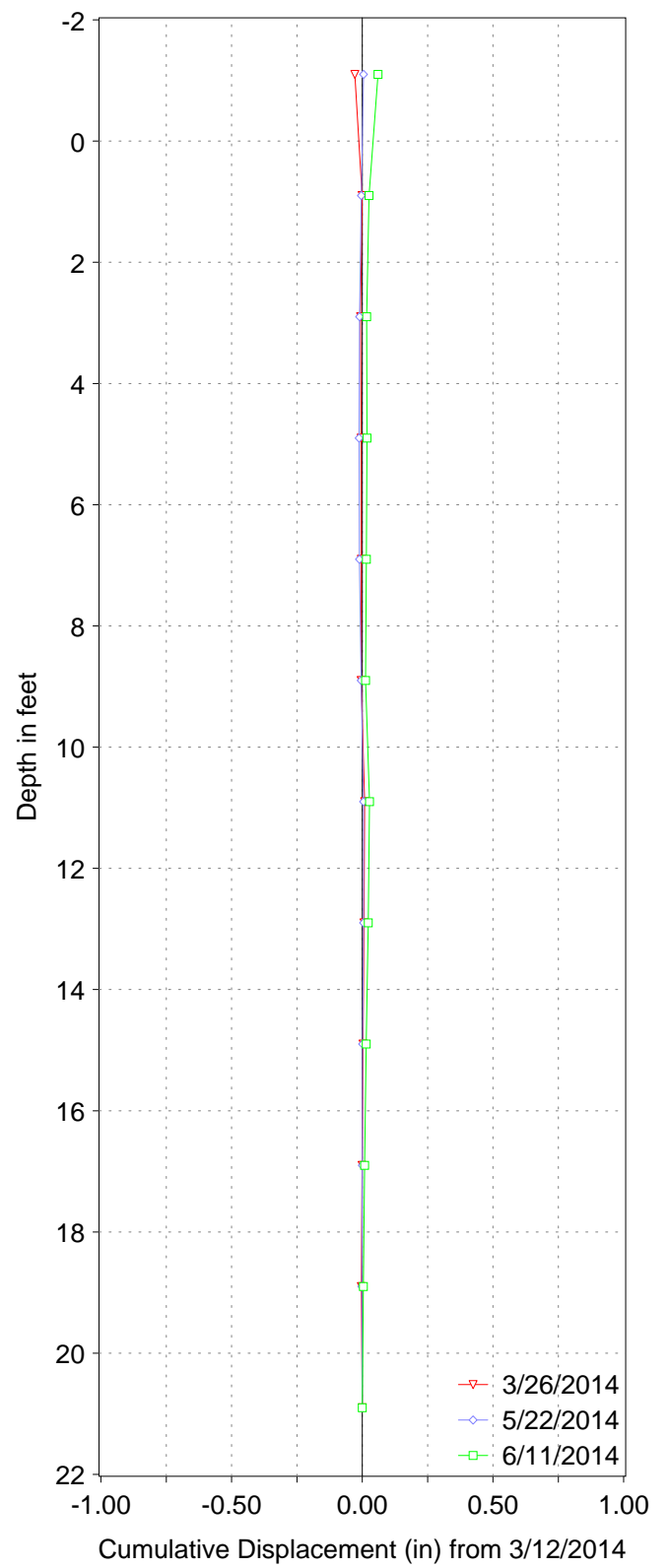


Rainbow Overlook  
BH-02

RAINB 3, A-Axis



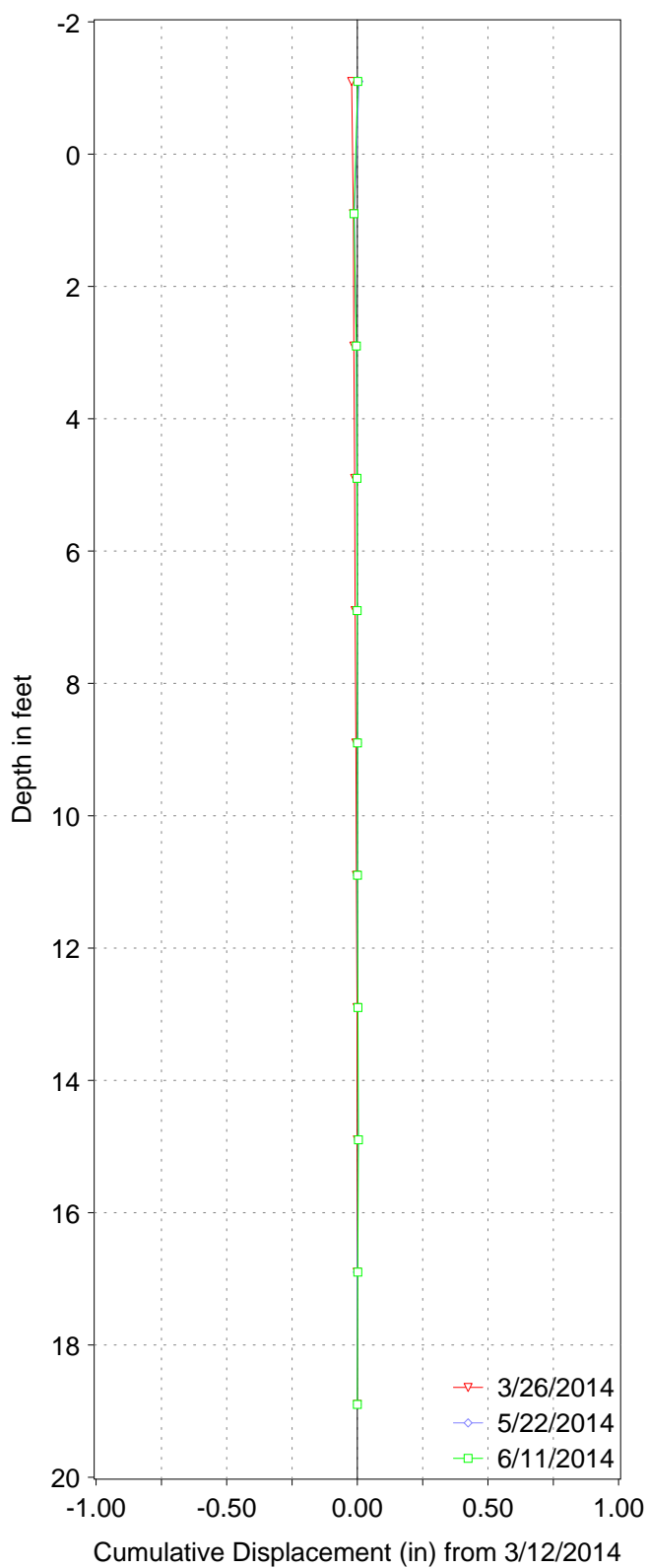
RAINB 3, B-Axis



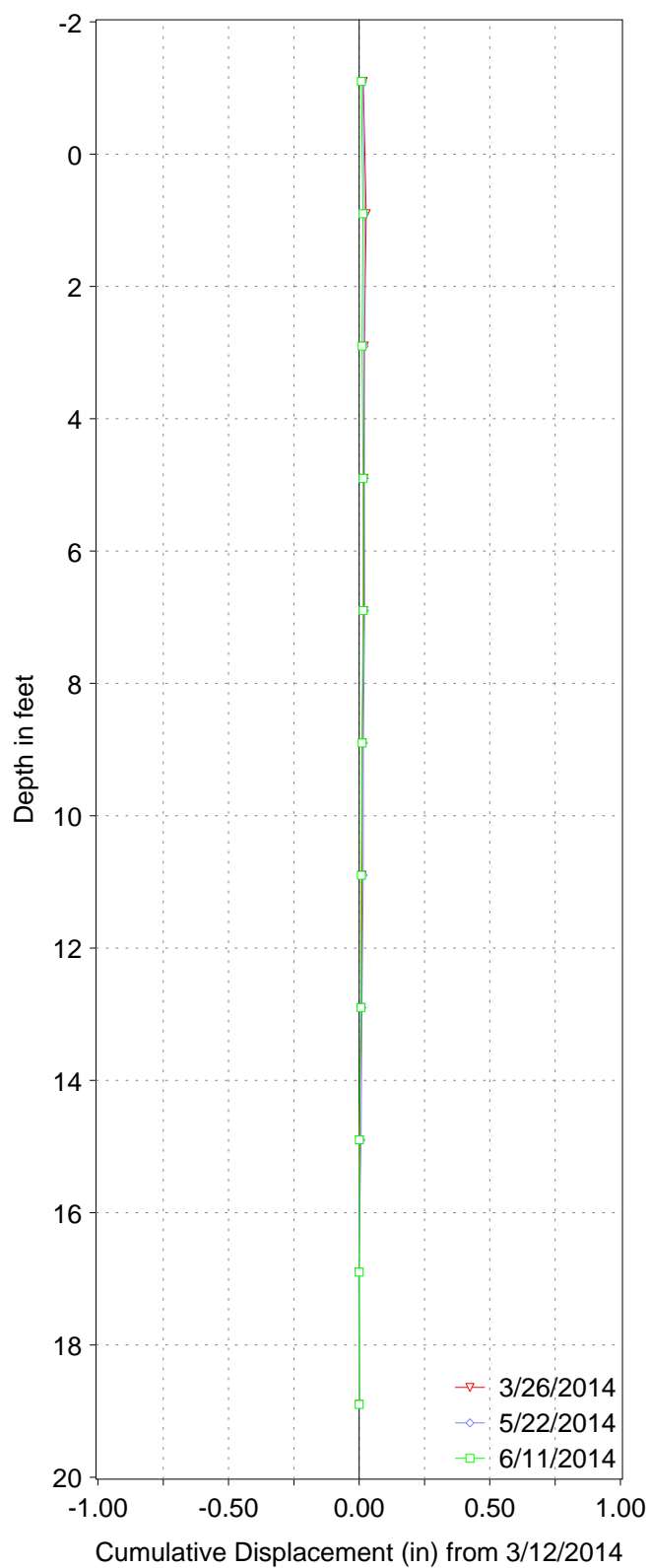
Rainbow Overlook  
BH-03



### RAINB B4, A-Axis



### RAINB B4, B-Axis



Rainbow Overlook  
BH-04

## Rainbow Dam Piezometer Readings

### Depth Below Ground Surface

Piezometer Nested Piezo #	P-01 A	B	P-02 A	B	P-03 #1	#2	A	P-04 B	C
3/12/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
3/26/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
5/22/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	14.88	Dry
6/11/2014	Dry	Dry	Dry	Dry	Dry	Dry	Dry	14.88	Dry



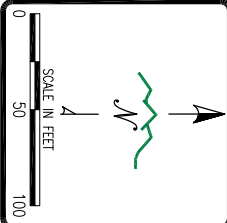


**DRAFT**  
NOT FOR CONSTRUCTION

REVISION		DATE	BY	DESC.
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...

DRAWN BY: JAL  
DESIGNED BY: ...  
CHECKED BY: ...  
APPROVED BY: ...  
PROJECT NO.: ...  
DATE: 08-02-14

DISPLAYED AS:  
COORD SYS / ZONE: NAD 83  
UNITS: FEET  
SOURCE: PIONEER



156

# RAINBOW DAM OVERLOOK



SHEET  
--- OF XX





Picture #: 1

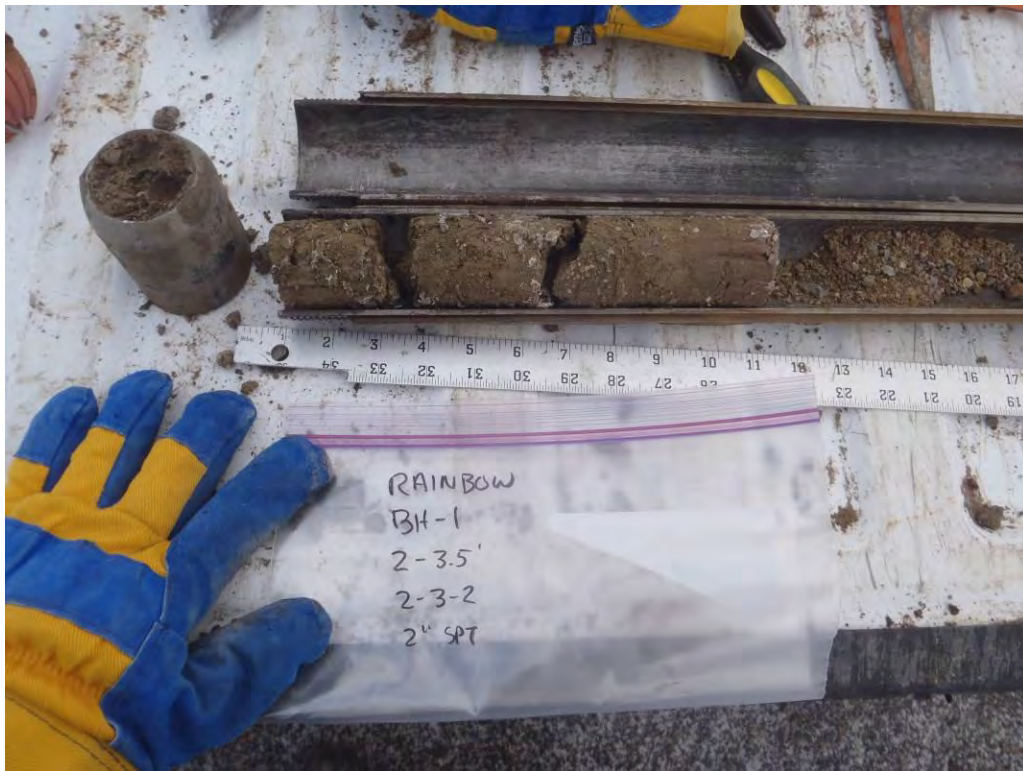
Description: BH-01;



Picture #: 2

Description: BH-01; 0-2 ft sample depth.





Picture #: 3

Description: BH-01; 2-3.5 ft sample depth.



Picture #: 4

Description: BH-01; 3.5-5 ft sample depth.





Picture #: 5

Description: BH-01; 5-7 ft sample depth.



Picture #: 6

Description: BH-01; 7-8.5 ft sample depth.





Picture #: 7

Description: BH-01; 8.5-10 ft sample depth.



Picture #: 8

Description: BH-01; 8.5-10 ft sample depth.





Picture #: 9

Description: BH-01; 12-13.5 ft sample depth.



Picture #: 10

Description: BH-01; 12-13.5 ft sample depth.





Picture #: 11

Description: BH-01; 13.5-15 ft sample depth.



Picture #: 12

Description: BH-01; 15-17 ft sample depth.





Picture #: 13      Description: BH-01; 15-17 ft sample depth.



Picture #: 14      Description: BH-01; 17-18.5 ft sample depth.





Picture #: 15      Description: BH-01; 18.5-20 ft sample depth.



Picture #: 16      Description: BH-01; 20-20.4 ft sample depth.





Picture #: 17

Description: BH-01; 20.4 ft sample depth.



Picture #: 18

Description: BH-02;





Picture #: 19

Description: BH-02; 0-1.5 ft sample depth.



Picture #: 20

Description: BH-02; 0-1.5 ft sample depth.





Picture #: 21

Description: BH-02; 1.5-3 ft sample depth.



Picture #: 22

Description: BH-02; 3-4.5 ft sample depth.





Picture #: 23

Description: BH-02; 5-6.5 ft sample depth – bag is mislabeled



Picture #: 24

Description: BH-02 location. BH-01 inclinometer and piezometers in foreground





Picture #: 25

Description: BH-02; 6.5-8 ft sample depth.



Picture #: 26

Description: BH-02; 8-10 ft sample depth.





Picture #: 27

Description: BH-02; 10-11 ft sample depth.



Picture #: 28

Description: BH-02; 11-12.5 ft sample depth.





Picture #: 29

Description: BH-02; 15 ft sample depth.



Picture #: 30

Description: BH-03 location;





Picture #: 31      Description: BH-03; 0-1.5 ft sample depth.



Picture #: 32      Description: BH-03; 1.5-3 ft sample depth.





Picture #: 33      Description: BH-03; 3-5 ft sample depth.



Picture #: 34      Description: BH-03; 5-6 ft sample depth.





Picture #: 35

Description: BH-03; 5-6 ft sample depth.



Picture #: 36

Description: BH-03; 6-7 ft sample depth.





Picture #: 37

Description: BH-03; 10-11.4 ft sample depth.



Picture #: 38

Description: BH-03; 15-16.5 ft sample depth.





Picture #: 39

Description: BH-03; 15-16.5 ft sample depth.



Picture #: 40

Description: BH-04;



Picture #: 41

Description: BH-04; 0-2 ft sample depth.



Picture #: 42

Description: BH-04; 2-3.5 ft sample depth.





Picture #: 43

Description: BH-04; 5-7 ft sample depth.



Picture #: 44

Description: BH-04; 5-7 ft sample depth.





Picture #: 45

Description: BH-04; 7-8.5 ft sample depth.



Picture #: 46

Description: BH-04; 7-8.5 ft sample depth.





Picture #: 47

Description: BH-04; 8.5-10 ft sample depth.



Picture #: 48

Description: BH-04; 8.5-10 ft sample depth.





Picture #: 49

Description: BH-04; 12-13.5 ft sample depth.



Picture #: 50

Description: BH-04; 12-13.5 ft sample depth.



Picture #: 51

Description: BH-04; 12-13.5 ft sample depth.



Picture #: 52

Description: BH-04; 13.5-15 ft sample depth.





Picture #: 53

Description: BH-04; 13.5-15 ft sample depth.



Picture #: 54

Description: BH-04; 15-16.5 ft sample depth.





Picture #: 55

Description: BH-04; 15-16.5 ft sample depth.



Picture #: 56

Description: BH-04; 15-16.5 ft sample depth.





Picture #: 57

Description: BH-04; 16.5-18 ft sample depth.



Picture #: 58

Description: BH-04; 16.5-18 ft sample depth.





Picture #: 59

Description: BH-04; 18-20 ft sample depth.



Picture #: 60

Description: BH-04; 20-22 ft sample depth.





Picture #: 61

Description: BH-04; 22-23.5 ft sample depth.



Picture #: 62

Description: BH-04; 23.5-24.25 ft sample depth.